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The Farmer's Digest

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The Farmer's Digest

Volume 14 April, 1951 Number 12

Take the Gamble out of Buying a Bull

Condensed from the Farm Journal

Paul Friggens

WHAT would you give for a set of bulls that you're pretty sure will add 75 to 100 pounds to your weaning weights in a few years—and boost your profits perhaps by one-fifth?

It's hard to buy bulls like that today. But the time may be coming.

Something *new* in sire selection is catching on in the beef business and it's taking a lot of the gamble out of buying a bull. It practically guarantees *heavier* calves and *faster* gains before weaning as well as on grass and in the feedlot.

It's cutting costs. You can produce *more beef* from the *same amount of feed!*

It's a better way to buy cattle than by show-ring standards, although many purebred breeders aren't quite ready to admit it. The new idea works like this:

One day last fall a buyer squatted on a corral fence of the Becker Hereford ranch in Park County, Montana. He was undecided between two young bulls that were a stand-off as to type and conformation. Then Eaton Becker suggested: "Let's go look at the books."

At his ranch-house office, Becker opened up a brand new kind of breeding record. There were the blood lines, as usual, but more important, he had recorded the weaning weights and gain *after* weaning of the calves in his purebred herd. You could see at a glance which herd sire was doing the best job. You could practically bet on his calves.

Becker traced the records to the pair of bulls in the corral. At 18 months one had weighed 1260 pounds. The much *younger* sire—by five weeks—had weighed 40 pounds more!

"That's your bull," said Becker. "He'll probably wean out calves

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that'll weigh 25 pounds more."

A few days later in California I saw a similar demonstration at the Crowe Hereford Ranch in Shasta County.

John Crowe turned out as fine a pen of range bulls as you'll see anywhere. The choice narrowed to three. One was a big bull, a little leggy and a bit high over the tailhead. He might be passed by in the show ring. But Crowe opened up a set of records like Becker's. The less showy bull had gained 110 pounds in 42 days on grain even while being weaned.

"I believe that's your bull," Crowe told the buyer. "He comes from a good milker, and he's sired by a fast gainer on grass or grain."

Ability to gain—something you can't see—was the deciding factor. In both cases, these purebred breeders were selling more than blood lines and conformation. The hidden ability to gain showed up in a big way on the scales. For the first time buyers had something besides looks to go on.

They call this *beef performance testing.*

The idea originated several years ago at the U. S. Range Experiment Station at Miles City, Montana. There, Dr. R. T. Clark, J. R. Quesenberry, Bradford Knapp and others, discovered after testing 1000 head that *eight out of every 10 fast-growing cattle produce fast-growing offspring.*

But the performance-testing idea has been slow to catch on. A lot of purebred breeders don't like it yet, and comparatively few practice it. More are coming to it, however, and commercial cattlemen are beginning to try it out. Around Miles City, they're paying premium prices for these performance-tested bulls. Purebred breeders like Becker and Crowe are building up their herds on performance testing. It's paying off.

"I've added at least 75 pounds to my weaning weights in 10 years," says Becker. Nowadays, he weans some 600-pound calves at 9 months. His average is 540. It used to be 465.

Becker believes a commercial operator can boost his gross income by 20% in reasonable time, "because he'll have that many more pounds to sell." In lean years that extra gain may mean the difference between profit and loss.

Crowe's records show that he upped his weaning weights an average of 100 pounds in 9 years by performance testing. He used to get a lot of light calves—some 350-pounders. Not any more. The last two years his bull calves averaged 600 pounds at eight months.

What are the mechanics of performance testing?

Here's how it works. The first thing you need is a good set of scales. "It's the best investment on a ranch," declares Becker.

He weighs each calf at weaning

time, and again as a yearling, Some are weighed every 30 days. Heifers are weighed at 18 months and when they wean their first calf. Frequently, Becker just picks his replacement heifers by the weights of their half brothers. Breeders like Becker and Crowe claim that all this doesn't involve too much extra labor. With a good corral set-up, they weigh and chart one calf every three minutes.

While they stress weaning weights, these breeders believe rate of gain *on grass* is even more important. They keep the calves that gain fastest for replacement breeding. They breed cows that have done the best job to the bulls siring the heaviest, fastest gaining calves, and cull the rest. If a bull doesn't deliver, he goes down the road.

"Performance testing doesn't have to be complicated," declares Prof. Fred McKenzie, livestock specialist at Oregon State College. In the case of Eaton Becker and John Crowe, neither had even had previous experience in the cattle business.

Becker started with a herd bull called Carlos Axtell that decidedly wasn't show-ring caliber. He describes him this way:

"He was a little too long in the back, too long in the neck, leggy and rough over the tailhead. But Carlos had a very full round and a deep pair of pants. He produced 15 sale champions and 3-pound-a-day gaining calves. Seven of his calf crops averaged 2½ pounds a day gain on feed!"

That was enough for Becker, who proceeded to stick to his new scales. He sold his first purebred calf for $72.50. This year his average was $700. Becker is rapidly building one of the finest purebred herds in Montana. Performance testing is doing it.

Although Becker is completely sold on this program, he flatly warns:

"Don't go overboard with performance testing! You have to start with good blood lines, and be sensible about conformation. You can't afford to pick a line-back, redneck, or a set of crooked legs, regardless of rate of gain."

The *ideal* way to pick a bull, Becker believes, is to look for five things, in this order:

1. *Birth weight.* "The bull has about 80% to do with this." (Becker is beginning to keep birth weights.) Miles City results show that *birth* weight is the safest indicator of *mature* weight.

2. *Weaning weight.* "I give the cow most of the credit. She's got to be a good milker."

3. *Rate of gain after weaning.* "Largely due to the sire."

4. *Hair.* "It's pretty important. I like a long-haired, light-colored sire." (There is no scientific evidence that color of hair has anything to do with performance.)

5. *Conformation.* "You can't

get too much size for grass-eating cattle, nor too much bone. I believe there's a correlation between heavier-boned cattle — roughness — and ability to survive tough calving conditions and abuse. I want a good head—for selling—but it's worthless without ability to gain."

All told, this breeder is convinced that performance testing is the best friend a cattleman ever had. *"It proves which sire is doing the best job."*

After ten years' experience, John Crowe feels the same way about performance testing.

"Some breeders think that they can remember a bull's record. I don't try to," says Crowe. "I rely on our books."

Crowe also grades his cattle. Thus he combines performance testing with a rigid grading system set up by the University of California.

With this combination of grading by the eye and checking by the scales, Crowe—in a short time—has built up one of the finest purebred herds in California. His score sheets for 1944 and 1950 on cows and heifers going into his breeding herd tell the story.

(Bear in mind that "Grade 1" is outstanding breeding stuff, or strictly fancy feeders. "Grade 3" is cows which usually should be culled from purebred herds, or good commercial cattle.)

Grade	*1944*	*1950*
1	None	4
1 –	None	28
2 +	11	135
2	29	81
2 –	88	16
3 +	110	None
3	45	None

Crowe has really bred milk production into his herd. Bull calves in a 42-day weight test just before weaning last fall gained an average of 2.63 pounds a day—on their dam's milk and irrigated pasture—there are no nurse cows.

Spurred by the Miles City findings and private breeder accomplishments such as Crowe's, the USDA and state agricultural experiment stations are developing a nation-wide beef improvement program with established breeds. Performance testing is a part of it.

Texas already is testing hundreds of bulls. Last year at the Madera Valley Station, Balmorhea, some bulls gained over a pound a day faster than others. Daily gains ranged from 1.43 to 2.52 on one group of sires fed for 143 days.

"In Texas trials, as at Miles City and elsewhere," says Dr. Clark, "we found we sacrificed nothing on carcass grade or yield. *"The big thing about performance testing is that you can select for fast-growing cattle, and at the same time develop the kind of conformation and finish the market wants."*

At Oregon State College Angus and Hereford bull calves were fed out for rate of gain. The low one-quarter took 40% more feed to put on the same gain as the high quarter.

"That means that if you were a feeder," says Dr. McKenzie, "you could finish out 140 fast-gaining steers on the same feed it would take for 100 slow-gainers."

Gilliam County, Oregon. Breeders and commercial cattlemen have started a unique program this winter. Angus and Hereford breeders have consigned 31 bulls to a 150-day feeding test, checking gains, feed per pound of beef, and winding up with a field day to boost production testing. It's the first of its kind anywhere. The new Gilliam County Beef Cattle Improvement Association looks as if it will go places!

Grant County, Oregon, ranchers have organized an association to do something similar. They're buying several $400 platform scales, and ranchers use a simple sheet for recording weaning weights.

In Montana, a dozen ranchers besides Eaton Becker are adding weight and profits by the scales. The few bulls available at the Miles City station are contracted through 1953!

Why don't more commercial cattlemen insist on performance testing?

Probably the program's too new. But Dr. McKenzie at Oregon State thinks that it's high time to create the demand. He urges this:

"Commercial cattlemen ought to ask for a gain of 3 pounds a day on the bulls they buy. In most cases the fast-gaining cattle are also the most economical to feed. This is a *dollars and cents* proposition."

McKenzie is encouraging commercial operators to keep their own weaning weights on a single sheet, and follow through with a program on their ranches.

A practical, easy way to keep cattle free of flies is to suspend burlap soaked in an oil-DDT solution from a wire. Two long fence posts are placed in the ground about 12 to 14 feet apart. Several strands of barbed wire are strung loosely between the posts and are wrapped with burlap. The burlap and wire hang low enough to reach the backs of the cattle. The burlap then is soaked every 2 weeks with a 2 per cent solution of DDT in oil. These "self applicators" are placed near watering, salting, or feeding places where the cattle congregate.

Getting the Good Out of Phosphate

Condensed from New England Homestead

William Gilman

ALONG with barnyard manure and green manure, farmers have been using commercial fertilizers for a good many years, and know pretty well which of them to use on different crops. But considerable research has been going on at the University of Massachusetts Agricultural Experiment station to increase the amount of good that a farmer can get out of the superphosphate he gives the soil.

The U. S. Department of Agriculture states that it is a well-established fact that poor crop quality and lower feeding value are more often connected with phosphorus deficiency than with deficiencies of any other mineral element.

Most farmers don't have to be told how to put chemical nitrogen into their soil, and what it does when it gets there. The same holds true for potassium. The fertilizer chemicals which contain them generally have no trouble dissolving in the soil's moisture. Roots suck in the enriched solution, and crops shoot up with a healthy look.

But the story is different with phosphorus, the third element of the "big three" most needed for soil fertility. This one happens to be stubborn.

And that is why a recent discovery at the University of Massachusetts provides important advice to farmers. Amherst's findings add up to this—the way to get a lot of good out of superphosphate is to pep it up with plenty of organic matter in the soil. Otherwise, the super is liable to be mostly dead weight.

To understand the importance of this discovery, it is necessary to glance at the background. Scientists have for some time been trying to help farmers out of their phosphorus-deficiency troubles.

In usual neutral or acid soils growing hay and many main annual crops, most of the super turns into stuff that won't dissolve. It just sits there, doing nothing, piling up year after year. Liming to raise the pH value doesn't help much. The trouble is—most of the phosphate meets up with iron and aluminum compounds in the soil. Chemical action follows, and precipitates phosphates which aren't soluble. Scientists call this "chem-

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ical fixation."

The phosphate thus becomes locked in the soil. It won't dissolve and that means the roots of crops can't draw on it. So the farmer keeps adding super to the land year after year in the hope of getting good back out of perhaps 10% of it.

Researchers at the Amherst station under Dr. Dale Sieling, head agronomist, have been concentrating on this important problem for several years and are now ready with results showing how to improve crop quality and its feeding value—how to prevent the soil from hoarding phosphate.

Dr. Sieling, incidentally, has just been named head of the university's Agricultural Experiment Station, as well as heading the institution's Schools of Agriculture and Horticulture.

In the latest stage of his phosphate research, he was aided by Joseph Dalton, a graduate student.

In the phosphate research, Dalton used samples of soil in which he planted ladino. He worked with ladino because it would give him several cuttings, for comparison purposes.

To one soil sample he added phosphate at the rate of a half ton of super per acre. To a twin sample, he didn't apply any phosphate. Instead, he added plain, ordinary starch—which is just about 0–0–0 as far as its fertilizer value is concerned. But when he cut and analyzed his ladino to see how much phosphorus had gotten into its system, the result was pretty dramatic.

The ladino fed with phosphate had only 87% as much phosphorus in it as the ladino fed with just starch.

This sounds impossible until you realize that Dalton was using soil which had been storing up phosphate for several years. Both samples already had loads of it—4,000 pounds of P_2O_5 per acre. That corresponds to 10 tons of superphosphate per acre. But less than 1% of it was in a soluble form quickly available to plants.

That's why adding still more superphosphate didn't do as much good as adding the starch—which unlocked that hoarded phosphorus.

Potatoes are heavy in starch. Would plowing under all those surplus spuds do the soil good? It would. But the Massachusetts research men aren't recommending that you starch your soil—there are cheaper and handier ways of accomplishing the same thing.

The starch was used simply as an example of something containing carbon—an organic material. And it's the carbon that frees the phosphate.

The idea is that your super is no more effective than the organic

material—whether barnyard manure, green manure or other humus material—that goes with it.

The importance of organic matter in maintaining soil fertility and tilth has long been known. But it's usually thought of in terms of adding nitrogen, increasing the soil's ability to hold water, and so forth. In itself, most manure is notoriously low in phosphorus. What the Massachusetts research shows, among other things, is the reason why it's better to mix super into your manure than it is to apply manure and phosphate separately to a field.

What happens is this: the organic material decomposes, with the help of soil bacteria, and forms organic acids. And it's these mild acids—a whole string of them—which turn the trick. They form stable, complex compounds with the soil's iron and aluminum. It's a matter of competition. The phosphate wants to grab at iron. The organic acid also wants that iron. And it's the organic acid that wins. It ties up the iron, leaving the phosphate free for plant use.

Dr. Sieling demonstrates this with a graphic laboratory test. To one sample of iron chloride solution he adds dissolved phosphate. And the mixture immediately turns white with a precipitate of iron phosphate. It's insoluble stuff. The phosphate has been "tied up"—useless to a plant.

To another batch of iron chloride, he adds citric acid—one of those organics. And now, when he adds phosphate, there is no precipitate. The liquid remains clear—its phosphate is "free."

What is more, this works in reverse too. Adding citric acid to phosphate which has already been tied up by iron causes the precipitate to disappear. The citric acid has grabbed off the iron—allowing the phosphate to go free.

In other words, manuring your soil or plowing under a good sod will furnish organic matter that unlocks most of that phosphate hoard which is in your soil.

What Dalton did was take such laboratory tests right to the soil. For organic matter, he used such things as starch and sugar—because they are practically free of any phosphate themselves, so that if any phosphorus appeared, it wouldn't be from them. And for his crop, he used the ladino which he could cut repeatedly and thereby have several sets of results which could be compared.

By using a greenhouse, he was able to take six cuttings. Each of the many samples was grown in triplicate and, when it was all over, he had analyzed over 1,000 samples. And his results didn't deviate a bit. Adding phosphate to the soil helped. But adding organic matter did even more good. The organic matter didn't create

phosphorus. But it put phosphate already in the soil to work!

As Dr. Sieling expressed it after previous work with another research associate, Paul Struthers: "The organic anions produced in the soil are nature's effective agents for preventing phosphate fixation, and for making available that phosphate which has already been fixed. Practical agriculturists should be able to get greater efficiency from natural and applied phosphates by management practices which encourage production of these effective soil agents.

Lespedeza Spreads Northward

Condensed from What's New in Crops and Soils

George H. White
Iowa State College

JUST a little more than 25 years ago farm leaders rejoiced when Korean lespedeza was introduced to farmers in the United States. It was widely adapted, superior to common lespedeza in hardiness, and it spread quickly.

This annual legume, with its almost unlimited soil tolerance, soon pushed the lespedeza belt northward 150 miles. It grew on acid soils, just as common lespedeza had done farther south. Both grew on thin, infertile soils, and actually saved land that had seemingly been eroded beyond recovery.

Now it's the farmers who are located up to 75 north of the Korean limit who can rejoice. The Iowa Experiment Station has released three new varieties that grow remarkably well as far north as Ames, Iowa and virtually all of Illinois, Indiana, Ohio and points east will realize the tremendous values of lespedeza, as so many thousands of farmers farther south have done.

Southern farmers have been delighted at the ease with which lespedeza can be established. It takes hold on the steepest banks and checks erosion. It produces a pasture that is held in the highest esteem. It survives under close grazing, and withstands drouth. It yields a hay that is easy to cure and hard to beat for nutritive value.

Farmers who depend on cotton,

Reprinted by permission from What's New in Crops & Soils, Madison, Wisconsin, January, 1951

corn, tobacco or other cash crops place the highest value on lespedeza as a soil-improving crop. It will fit into almost any rotation, and being a legume, it adds nitrogen to their soils.

Wildlife men can also appreciate the seed of *Lespedeza bicolor* for its top-quality gamebird feed.

Long before America was settled, clover was the most common useful plant with "three-parted" leaves for cattle feed. Consequently, any plant with three-parted leaves was called a clover. And since some lespedeza seed came from Japan, lespedeza took on the "Japan Clover." Actually, it is not much more than a second cousin to clover.

We have records telling of common lespedeza in this country as far back as 1846. Seed probably came over from the Orient in straw used as packing in crockery shipments. Newspapers in Georgia, where it was first introduced, show that some people were enthusiastic about its value, others doubtful.

Regardless of some skepticism, common lespedeza soon spread to Alabama, Mississippi, Tennessee, Missouri and Kentucky. Its use today is primarily in the South.

Korean lespedeza was brought into the U. S. in 1921 by Dr. Ralph Mills, who found it in Korea. It was noted that it produced more seed and forage than any other lespedeza grown in tests as far north as Washington, D. C. It is larger and coarser than the common, and has a distinctive broadleaf. Korean, some farmers say, can be eaten to the ground and still set seed.

Today Missouri alone has 13,000,000 acres of Korean lespedeza. That's more acreage than Iowa has in corn!

One day in 1919 J. B. Norton, explorer for the U. S. Department of Agriculture in Japan, was walking through the hills near the city of Kobe. When he sat down to rest, he noticed some plants that he first thought were common lespedeza, but they appeared somewhat larger. Like a true agronomist, he took the plants with him. The following year he sowed the seed in his garden in South Carolina. As a result, Kobe lespedeza, an improved strain of common lespedeza, was here to stay. It is now useful as a meadow crop in the South, giving excellent yields of both hay and pasture.

The next lespedeza to gain a foothold in this country came from a botanical garden in Japan in 1923. This was a perennial—*Lespedeza sericea.* Apparently, seed had been sent here as early as 1899, but it had gone unoticed. It may be that farmers were so enthused over alfalfa that they were more interested in finding a soil to suit alfalfa than in finding another crop to fit their soils.

An interesting story about seri-

cea was related by the late J. Sidney Cates in a *Country Gentleman* article:

Farmers in Tennessee had observed a "weed " spreading along a creek. They noticed that cattle liked it, and crops that followed in those areas where this plant grew were also improved. Any "weed" that would provide good feed and also improve the soil was certain to be welcomed by farmers in that poor-land region, and sericea was no exception.

And now, slowly but surely, we're broadening the lespedeza country again. One obstacle has been the problem of getting varieties that were early enough to set mature seed in relatively cool temperatures, where short grazing seasons prevail.

Iowa 6, Iowa 48 and Iowa 39, improved varieties of Korean developed by the Iowa Agricultural Experiment Station, are just "what the doctor ordered." They can be depended upon to produce mature seed and shatter readily, thus reseeding themselves as far north as Ames, Iowa. In pastures, for all practical purposes, they may be considered as perennials.

At one time, more than 70 strains were being developed and studied at the Iowa Station. Every one of them was early maturing. Three were finally selected for their vigor and extreme resistance to the wilt disease.

Iowa 6 is outstanding in that it is highly productive of both forage and seed. It is the earliest of the three, so it is best in areas where seasons are short. Growth of 18 to 20 inches and seed yields of 600 to 800 pounds per acre have been made in Iowa. A 3-acre field of Iowa 6 lespedeza has produced 1,000 pounds of seed per acre.

Iowa 48 is a little more productive of forage than Iowa 6, but it can't match the seed yields of the latter.

Iowa 39 is peculiar in one respect. It thrives on soils high in free calcium carbonate! Usually lespedezas under these conditions are chlorotic; they turn yellow and soon die. However, growth of Iowa 39 is vigorous, and it has already proven itself in various parts of the country, where "high-lime soils" are found.

Many farmers will sow these new varieties with their oats. When the oats are grazed off, the lespedeza will come on as midsummer pasture. Most pastures are dry and hard then, but not lespedeza. It is luscious and nutritious.

Lespedeza of one type or another will make excellent use of otherwise unproductive land. Regardless of how it is used, its value is hard to overestimate. It's no wonder that we're glad to see the lespedeza belt expanding again!

High Profit Per Hen

Condensed from Successful Farming

William R. Ward
Cornell University

"THAT'S almost unheard of—a poultryman making $8 per bird above purchased feed costs." I couldn't quite believe it, so, to find out firsthand, I went to Francis Snow's poultry farm near Memphis, New York.

In a nutshell, here are the dollars and cents figures from his 1949 record book: Feed purchased for 1,300 birds, $2,000; a 12-month average egg production of 229 eggs per hen; total gross income, nearly $13,000.

Snow's formula to get these results? He grows all the feed for the poultry on the farm except the starter mash for the chicks. And, as a part of good, general over-all management, he saves labor all down the line from feeding and watering the chicks to marketing the eggs.

As Mr. Snow points out, egg prices have skidded. The profit and loss columns may be different this year. Flock numbers, though, have been jumped to 2,400 White Leghorns and next winter will be increased to 3,500 when a barn is remodeled this year on another farm bought recently. Eventually the new laying quarters will have three or four floors.

He and his son Gerald, 19, operate 300 acres of good land on a father-and-son partnership agreement worked out with an agricultural economist at Cornell. Their objective, they told me in very definite terms, is "to get in a position so if another depression comes along we can weather it." They aim to keep on expanding slowly and make a reasonable income even on cheap eggs.

The father vividly remembers the depression of the thirties, and he related an incident that has helped to pattern his way of doing business ever since. Their check for 12,500 pounds of milk in February, 1932, totalled $75. The hauler got $25 of this and a hired man $40, leaving $10 for the Snows "to buy grain for the herd and necessities for the family." The money and the products from a few chickens kept their "heads above water."

Reprinted by permission from Successful Farming,
Des Moines, Iowa, September, 1950

The Snows still keep dairy cows, and good ones, I might add. But they'll vote for the poultry, considering labor, land use on their farm, and profit. And speaking of the profit, he mentioned that hens brought 50 per cent more than cows for "a lot less effort."

Beginning with 300 chickens on the home farm, Mr. Snow expanded the flock to 750 after buying an adjoining farm in the spring of 1942 and using the basement of the barn. Six years later, he and his son remodeled half of this barn to provide room for 1,000 hens. The following year, the remodeling was completed, doubling the henhouse capacity.

"The step- and backache-saving features of this poultry house, worked out by us and Charlie Ostrander, our assistant county agent, make poultry chores a pleasure instead of a drudgery," insists the younger partner.

A bucket elevator takes the feed to the peak of the poultry house and dumps it into a big, V-shaped bin divided into three sections. In one goes the mash, into another oats, and scratch grain into the third. Three chutes run from here to each of four floors.

Automatic waterers with heating cable and the automatic "by-the-clock" lights cut out any fussing with this phase of poultry chores. Litter is shoveled through chutes to a spreader. A well-designed, yet inexpensive, fan and air-intake ventilating system keeps that straw litter dry as dust. Nest rooms near the doors speed up egg gathering, and the automatic egg washer takes the work out of cleaning dirty eggs. Added to these laborsavers is an electric grader.

The storage right next to the egg cleaning and sorting room on the first floor was built by the Snows with insulated concrete blocks. A constant spray of cold well water on a heavy burlap curtain keeps the room at about 60 degrees and the humidity at a high level. This, along with top-quality eggs in the first place, pays off in the form of a bigger egg check each month. The dealer in New York City, to whom they ship their eggs, pays them 1 cent a dozen above the top market on large eggs and the top market on mediums.

The two men follow a set routine on chores. The time adds up to about 2½ man-hours a day for 2,400 birds including feeding, gathering eggs, cleaning, grading, and packing. They don't go near the chickens until about 10:30 a.m., and then they feed oats in one hopper, mash in another. Egg gathering is next.

After lunch, wet mash is fed and that day's eggs are cleaned and put in the cooler room. The eggs from the day before are graded and cased. Sometime between 4 and 5 p.m., grain is fed

and eggs gathered again. The scratch grain—whole corn, wheat, oats, and barley—is mixed in the hopper next to the elevator.

"We're better satisfied by renewing the flock every year," Mr. Snow explains, "and we buy the best chicks even though they may cost a little more." They're brooded now in various small movable houses, but future plans call for a large, permanent hot-water-heated brooder on the second floor of a converted barn.

With the strain of chicks he gets from Monroe Babcock, a poultryman in nearby Tompkins County, he has had very little trouble with diseases, leukosis included. He plans to start a bronchitis and Newcastle immunization program this year, but the mortality rate in his flock is substantially lower than the average. On Northwestern poultry farms an average of 15 percent of all chicks die before they reach maturity, and more than 25 percent of the hens die during the first year. Records show that the loss of layers on farms that keep accurate accounts range from a low of 10 out of each 100 layers, to a high of 59.

Both for health and feeding purposes, the birds are put on Ladino pasture as soon as the weather permits, and the Snows figure that each acre is worth several hundred dollars to them. For their poultry and dairy operations, they have 33 acres of pasture, 26 acres of hay, and 120 acres of grain. The average grain yield hits at least 1½ tons an acre. Why the big grain acreage? He's dead set against raising other cash crops (such as peas and beans), selling them at wholesale, then turning around and buying grain for feed at retail prices. Each piece of land yields high because Mr. Snow believes the soil also needs working capital. Manure, superphosphate, and lime (where needed) are spread before plowing, then 5–10–10 or 10–10–10 with the seeding.

Through careful planning and hard work, the Snows built "from the bottom up" a sound farm business.

Egypt—Yesterday, Today, Tomorrow

Condensed from Foreign Agriculture

Ralph S. Yohe

NAKHT was a minor official at the court of the pharoah around 1400 B. C. He owned many fields in upper Egypt near the capital city of Thebes. In the spring, laborers plowed his fields with oxen hitched to crude wooden plows or turned the rich Nile-made soil with heavy hoes. Others crushed clods with hammers and broadcast wheat over the fields by hand. At night they walked in groups back along the irrigation ditch to their small one or two rooms in the crowded village made of sun-dried brick.

When Nakht died, artists painted these scenes on the walls of the tomb where his mummified body was placed. The tomb was sealed and soon forgotton.

Well over 3,000 years have passed; and where American archaeologists recently found the tomb of Nakht, the small farming village of El-Qurna now stands. In the spring the farmers of El-Qurna go out to the irrigated fields nearby to turn the rich soil with crude wooden plows hitched to oxen or by hand with heavy iron hoes. They broadcast the wheat by hand. In the evening they return in groups, along the irrigation ditch, to their one or two small rooms in the mud village of El-Qurna. Farm life in Egypt seems to be frozen to the pattern of the pictures that I saw painted on the tomb of the ancient landlord Nakht, who lived more than a hundred generations of farmers ago.

One of the many reasons for this unchanging pattern is that there are too many people on too few acres. Most of Egypt is a desert, across which threads a narrow ribbon of green—the rich, irrigated Nile Valley. In this intensely farmed valley, that makes up a mere 2½ percent of the land of Egypt, live nearly 20 million people in one of the most densely populated regions of the world. From 1,500 to 2,000 people live on every square mile. About 70 percent of these people live the lives of farmers—fellahin—and tend, with nearly unbelievable care, three crops each year of vegetables, grain, cotton, and clover.

A few miles out of Cairo, I visited one of these farm villages, Sendion. Like most farm villages, it is a thick cluster of houses crowded up against an irrigation ditch.

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Some of the older people volunteered to act as our guide through the village. We headed up the narrow street, hemmed in by two-story adobe houses, past women selling roasted peanuts. We stopped at the local weaving factory. Here village men sat at some 29 handlooms weaving cotton cloth. One man weaves about 12 feet a day and earns around 40 cents, considerably more than he would earn as a field hand.

More factories are badly needed in Egypt, to syphon off the surplus farm people. As it is, they must remain on the land, further increasing the number who must earn a living from the soil.

We walked through a door in a mud wall into the small garden court of the local beekeeper. In addition to the few stands he has himself, he looks after the bees belonging to the village. He took us through his rabbit hutch housed in a small adobe building. Here he showed us improved varieties of Belgian hares but explained to my interpreter that rabbits were difficult to keep in the village. They seem to come down with one disease after another. Of more interest to me was a large dome-shaped pigeon roost on one of the buildings next to the court. I supposed that he kept the pigeons for meat since I had seen women selling squabs in the downtown market streets of some of the towns. But he told me that he keeps them for the rich manure they make, which he sells to farmers for their land.

Nitrogen fertilizer must be used to keep up the high fertility of the soil, and every bit of manure is carefully saved. In addition, Egypt imports around 600,000 tons of nitrogen fertilizer a year. With plenty of rock phosphate, it exports about 330,000 tons annually.

As we walked down the path along the irrigation ditch toward the fields, we met donkeys jogging toward the village with loads of green Egyptian clover. Across the ditch, three camels moved in solemn procession.

Nowhere in the world can you see more graphically the importance of water than along the irrigation ditches of Egypt. These ditches are the fellah's only defense against the encroaching desert. They carry water to irrigate his fields. Here he brings his livestock to water. Here his wife washes the few clothes belonging to the family or scours her few cooking pots and pans. Frequently during the day, the fellah lies on his stomach to drink from the ditch and here in the evening he bathes himself.

We passed a small orange grove and plots of broadbeans on our way to see a group of water buffalo herded out in a field of clover. Highly adapted to the hot

climate of Egypt and immune to many pests and diseases, the water buffalo furnishes the farmer with power, meat, and milk. But only the better-than-average farmer in Egypt owns any livestock. And then he generally owns no more than a buffalo cow or a cow, a donkey, a few chickens, and one or two sheep or goats.

With the pride of farmers everywhere, the villagers showed me their new buffalo bull from the Government breeding station. The Egyptian Government has developed some very good high-milk-producing strains of water buffalo.

As we walked along, we saw a man measuring off his clover with a long measuring cane pole, just like the measuring sticks I saw painted on the walls in the tombs of the kings of ancient Egypt. His field was very small as are most fields in Egypt. More land is the big need of most Egyptian farmers. Three-fourths of them are tenants. More than half of the cultivated land is in big estates, and 95 percent of all landowners have 5 acres or less. Estimates place the amount of land needed for a family to earn a basic living standard at 4 to 5 acres.

The Government is trying to increase the amount of irrigated land by building dikes to hold back the sea water in the salt marshes of the delta, similar to those in Holland. Long-range plans call for increasing the height of the Aswan Dam. But even these will add only a maximum of 2½ million acres unless large-scale projects are built on the upper Nile in the interior of Africa. Some steps are being taken toward land reform too. I understand that about 5,000 acres a year are being turned over to landless farmers.

On the way back to the car, we passed the Government's modern new health center. Basically designed to teach the villagers the rudiments of sanitation and simple hygiene, the center has also taught the farmers the value of improved crop varieties and better farming methods. The center helped establish the weaving factory we saw and a knitting factory. Villagers told me that they were living better since the center came.

In sharp contrast to the primitive methods of agriculture on the land is the Ministry of Agriculture, with its up-to-date experiment stations and highly trained personnel. Lacking so far has been an American-type extension service and an elementary education system to equip the farmer with the knowledge gained in the experiment stations. Important among the Government's activities has been the sponsorship of farmer cooperatives, which now have 150,000 members.

These are promising beginnings that the Government has made in

improving rural life. How far they will go is yet to be seen. At best, the Government faces a tremendous job, which, even with Point Four aid, will present a long-time challenge.

High Production per Farm Worker

Condensed from the Ohio Farmer

"AMERICA, the Land of Plenty!" We have used that expression so much that it has almost ceased to have meaning. But, did you ever stop to wonder why it is that we never have a famine in this country? Why it is that we can produce food in abundance while other nations continue to feel the pangs of starvation?

The inventive genius of America which substituted mechanical power for the muscle of man and beast is a big part of the answer. It isn't because we have larger crop yields or more land per person. The answer is in the fact that we have learned how to produce more food per worker. Each agricultural worker in the United States now produces enough food and fibre to support 15 people. And, that productive ability depends upon machines to make the worker more efficient.

Farming hadn't changed much from Bible times until the period just before our Civil War. The flail, the sickle and the scythe, the hoe and the ox yoke,—these were the common farm implements of Bible times and they remained common farm tools until about a century ago.

But, much has happened in the past 100 years! The walking plow has given way to tractor-drawn gang plows, hand seeding has been replaced by the grain drill and the check-row planter, the cradle has has been replaced by the combine, and the scythe by the power mower.

When the Pilgrims tilled their small fields by hand at Plymouth Rock, their methods were little different from those of Ancient Egypt, Greece and Rome. Even the restless pioneers who pushed westward across the Mississippi some 200 years later had only crude plows at best. They usually resorted to the hoe and the ax to cut holes in the prairie sod where the seed of their first corn crop might take root and grow.

Reprinted by permission from the Ohio Farmer, Cleveland, Ohio, January 20, 1951

The earliest plow was a forked stick with which men scratched or gouged the soil before seeding. The Egyptians credited one of their gods, Osiris, with invention of the plow, while the Greeks gave credit to Zeus, the king of gods, and the Romans to Dionysius.

Drawings made as early as 6000 B.C. in ancient Egypt and Mesopotamia show a Y-shaped stick, apparently tipped with bronze, and used in a manner similar to our hoe or mattock. With one branch of the Y left a little longer to serve as a beam by which a slave might pull it, the implement became a plow.

Following this early progress, there was only one significant step forward in the next several thousand years. Eventually, men learned to harness animal power to the plow. This was one of the great discoveries of all time because plowing calls for more power than any other operation in farming. Had man continued through the centuries to demonstrate inventive genius, history's pages might not have been littered with the undernourished bones of millions who died from hunger.

Unfortunately, progress in plow design seemed to lie dormant for thousands of years. Except for minor refinements, plows changed but little until the eventful period which began shortly after 1800.

The most advanced harvesting implement known to the westward-bound settlers in the early 1800's was the cradle. It was simply a scythe with a wooden framework to catch and bunch enough stalks for a sheaf, making them easier to bind by hand. The scythe, in turn, is a long-handled version of the sickle, which is the most ancient of harvesting tools known to man.

Pictures on an Egyptian tomb built some 1400 or 1500 years B.C., show grain being cut with sickles and carried away to be threshed by tramping oxen. Not much progress was made during the span of more than 3,000 years from that era to the days of the American Covered wagon!

All of the earliest implements were swung, pushed or pulled by means of human muscle. Slaves, usually women, pulled the forked stick plow of early history, scratching the soil for a skimpy seedbed. Since man runs a poor second to animals as a beast of burden, it was only a question of time until some ingenious farmer learned to harness oxen by means of a yoke on their horns and later applied to the neck.

Some historians consider the horse collar almost as important a milestone in agricultural history as the invention of the wheel. The collar, which enabled farmers to utilize the motive power of horses, came about 1000 A.D. Our own

colonial records show a regulation that "Hitching ye animals by ye tails is a cruel practice and is therefore forbidden."

Although man, through these inventions, was able to transfer to beasts of burden some of the labor of growing food, the fact remains that wasteful hand methods have stayed to plague the world throughout the centuries.

The "age of animal power" did not come into its own in this country until around 1850. Even then, much work was still done by hand because of lack of the proper implement to do the job. Even today, hand operations are still the rule in many parts of the world where there is no farm equipment industry to build efficient tools and no farm equipment dealer to distribute and service them.

But animal power, although helpful, was only a short step forward. Farming with horses or mules was a life of sweaty drudgery, of long, discouraging hours with but meager returns. It was the "age of tractor power," which really began during World War I, that freed agriculture from its age-old bondage and brought a new, golden era of better living to the farmer and his family. To the consumer, it brought an abundance of quality food and fibre previously unknown in the annals of man, and at reasonable prices.

DDT Doesn't Harm Soil

DDT in ordinary doses used to kill crop insects will not harm the soil, declares Harold Gunderson, extension entomologist, Iowa State College. In huge amounts, 25 pounds or more an acre, the chemical may affect some susceptible plants such as tomatoes, strawberries and bush beans. But for insects, like the corn borer, application of actual DDT will likely not exceed 1½ pounds an acre a year.

Heat and light break down DDT. Very little of it would be plowed into the soil. If the soil is well supplied with organic matter DDT breakdown is hastened. Tests run so far indicate no injury to corn, soybeans, alfalfa and clover, from large amounts of DDT, Gunderson says.

—Cappers Farmer

Chemical Aid in Weed Control

Condensed from the Florida Grower

R. A. Dennison
Associate Horticulturist, University of Florida Agri. Exp. Station

Use of chemical weed killers has become the third large-scale application of chemicals on the farm. The first big development in agricultural chemistry was the introduction of chemical fertilizers. Next came insecticides and fungicides. Recently, the weed killers—chemical herbicides—are being used extensively is some phases of agriculture.

Only in recent years have the chemical weed killers attained general popularity, but use of chemicals for controlling weeds is not a new practice. For centuries such materials as salt, ashes, and by-products from industrial plants have been applied to roadsides, fence rows, and pathways to rid them of vegetation.

About the turn of the century, agricultural workers both in America and Europe discovered that sulfuric acid, copper nitrate, sodium nitrate, ammonium sulfate, and potassium salts would kill certain plants without harming or killing others. In the early part of the century the American Steel and Wire Company became interested in the use of iron sulfate as a weed spray, because it offered a profitable outlet for a by-product of their industry. Iron sulfate was found to be useful for controlling weeds in grain fields.

The number of chemicals capable of affecting plants adversely is unlimited, and includes both organic and inorganic chemicals. However, only a few of these approach the requirements for a satisfactory herbicide, that is, "Highly toxic to weeds and inexpensive enough for economical use."

The chemical methods for weed control may be divided into four classifications, depending upon the way the material is applied and its mode of action in the plant: (1) contact herbicides, (2) translocated herbicides, (3) soil sterilants, and (4) hormone sprays.

A contact herbicide kills only the plant tissue to which it is applied or the tissue that the chemical contacts. These materials produce about the same effect as hoeing or cutting the weeds. There are two kinds of the contact herbi-

Reprinted by permission from the Florida Grower,
Tampa, Florida, November, 1950

cides—non-selective and the selective. The non-selective sprays kill all the growth with which they come into contact, regardless of the type of plant. Some examples of materials used for this purpose are petroleum oils, acid sludge from oil refining processes, sulfuric acid, and solutions of sodium arsenite, sodium chlorate, sodium chloride, and copper sulfate. These materials are used to control weeds on land where no crops are grown.

Selective contact herbicides will kill weeds in a growing crop without injuring that crop beyond the point of recovery. The selective sprays have been used successfully with onions, English peas, field or Southern peas, carrots, and parsley. The best known of the selective sprays is a material called "Sinox", which is an acid dye made from by-products of coal distillation. Weed killers in this group are sometimes referred to as the "dinitro compounds". They kill such weeds as chickweed, lamb's-quarters, mustard, pigweed, and ragweed.

The second group of chemical weed killers are the "translocated herbicides". These are poisonous chemicals, applied as sprays to the foliage, and moved through the conductive tissue into the roots of the plant. Some of the translocated sprays are the acid-arsenical solutions, sodium chlorate, ammonium thiocyanate, and acidified copper sulfate. The translocated sprays have not found much usage with vegetable crops.

Third class of herbicides is the soil sterilants, so-called because they are applied to the soil and render it unfit to sustain plant growth. Soil sterilants are classified either as "temporary" if the soil sterility lasts less than one year, or "permanent" if sterility lasts longer.

Two temporary soil sterilants commonly used are carbon bisulphide and chloropicrin (or "tear gas"). These liquids are inserted into the soil to a depth of several inches. They volatilize, spreading through the soil and killing the plant roots with which they come into contact. Chloropicrin has been used in vegetable seed beds. Cost of the material and labor involved in application make soil sterilants relatively expensive. Permanent soil sterilants have little or no application on vegetable crop lands.

Most recent development in chemical weed control is the use of hormone sprays. Minute quantities of these materials are able to induce remarkable changes in plant growth. Most important and widely publicized of these is 2,4-Dichlorophenoxyacetic acid, or more commonly referred to as "2,4-D". The acid itself is not used as a weed killer; it is too nearly

insoluble. To be of value the acid must be changed to a soluble or emulsified form. There are three ways this is done commercially—the acid is converted to a sodium salt, an amine, or an ester compound. The sodium salt and the amine of 2,4-D are water soluble; the ester is not water soluble, but dissolves readily in mineral oil, and this solution may be emulsified to form water-based sprays.

2,4-D is a selective herbicide, for both the type of plant and the stage of growth of plants. Established grasses and cereals usually are not affected adversely by the material. Sweet corn after it is several inches tall will not be damaged by 2,4-D sprays, but the germinating seed and young seedlings may be severely injured.

Many broad-leaved plants produce violent growth reactions when sprayed with 2,4-D. These effects are manifested by bending, twisting, and splitting of the stems, as well as yellowing of the foliage. The esters of 2,4-D are especially dangerous to use in a diversified farming area. Even after application, the esters may volatilize and drift to sensitive crops such as tomatoes, green beans, peppers, and eggplants.

Environmental conditions have a pronounced effect on the success of an application of a herbicide. Weather, soils, competition with the crop and other weeds, each affects the resistance of weeds to sprays. In general, weeds growing rapidly under conditions of optimum soil moisture, moderate sunlight, high humidity, and balanced nutrition are relatively susceptible, since they are succulent and have thin leaves. Adverse weather conditions cause weeds to become resistant to sprays.

There are many problems connected with the use of chemical weed killers for vegetable crops. While these materials will undoubtedly prove to be an aid to the vegetable grower, the cultivator is still an important implement and must be used.

That Weak Calf Problem!

Condensed from the Guernsey Breeders' Journal

Dr. J. W. Bailey

CALVES that are weak at birth and die shortly afterward represent a loss of several million dollars annually to American dairymen. That isn't all, for even some of those puny calves that live may represent losses. That is because a great many of them will turn out to be chronically unhealthy or "shy breeders" in later life. Whether they live or die, then, those weak calves are poor bets for helping owners to build a herd and pay off debts. They may be born at any time of the year, but most of them are probably seen in the late winter and early spring months.

Since those weak calves appear as such an important obstacle to profitable herd management, they are worth a little consideration. Naturally, of course, most breeders are interested in knowing why big strong cows so often give birth to puny, half-dead offspring. There is no single cause that applies in all cases. Instead, there are four that may operate singly or in combinations to make calves weak at birth.

1. The cause may be some contagious reproductive disease like Bang's or vibriosis. Such troubles often affect the health of calves even though they are carried full term. This is because the infection may cause a form of blood poisoning that is active in the calves for weeks before they are born. Remember those babies that came covered with yellow slime or brownish goo? That filth simply meant that the calves had been affected with diarrhea before they were born, and the chances are good that the scouring was caused by some kind of infection. It isn't always a reproductive disease that causes such symptons, but it certainly is in most of the cases. Whenever they're affected with diarrhea, it's perfectly natural for calves to be born weak, of course. Scouring makes older calves weak in pretty short order, too.

2. The cause may be a lack of vitamin A in the feed of the pregnant dam. This vitamin has the special job of protecting the lining of intestines against bacteria and is mighty important in getting newborn calves off to a good start in life. When cows aren't able to supply plenty of it for unborn calves, intestinal infection

Reprinted by permission from Guernsey Breeders' Journal, Peterborough, N. H., February 7, 1951

often occurs to make the youngsters half dead at birth. There's a good reason why many of these weak calves are born in late winter or early spring.

Green feed represents the major source of vitamin A for cows and there's little of it available in most areas during the winter. Some of the vitamin may be obtained from leafy green hay, but along toward spring the hay is apt to be brushy "first cutting" with the later crops long since fed up. Even good hay may vary from year to year in vitamin A content, probably because of differences in the growing season, so well colored hay can't always be depended on to supply it either. A deficiency of vitamin A isn't always present since cows are able to store it in their livers during the pasture season. However, after drawing on this reserve supply all winter, there may not be much left for the calves of some cows. Because cows vary in their ability to store vitamin A, some will have plenty to insure strong calves while others standing along side them will not.

There is no doubt but what vitamin A is passed on to unborn calves, since work at both Cornell University and Kansas State College has verified this fact. In addition, the Cornell experiments demonstrated that calves from vitamin fed cows were healthier than those from dams given standard rations before freshening. They made greater gains and had less scour trouble than the controls.

3. The cause may be general nutritional deficiencies in the rations of pregnant dams. We hate to admit it, but a great many of our grand old cows are "roughed" through their winter dry periods on feeds like straw and corn fodder. Not only that, but on some farms there's precious little of even these poor feeds at certain times. A ration of this kind always represents a danger of too little protein and such a shortage can lead to trouble. This is because unborn calves need plenty of protein for development and a lack of it can mean weakness at birth.

4. The cause may be lack of iodine in the rations of pregnant cows. More and more frequently this trouble is being noticed in areas once believed to be safe against it. Since a deficiency of iodine doesn't always cause symptoms of goiter, it may be unsuspected as a cause of weak calves. When iodized salt has been fed free choice it may escape suspicion even in areas definitely known as iodine deficient. This is regrettable, since the feeding of iodized salt does not always prevent trouble from iodine deficiency.

Sometimes the iodine evaporates from salt that has been improperly stored for long periods. Again the cows may fail to eat enough of the salt to supply their

iodine requirements. It is possible that other trace elements like cobalt and manganese are also important in relation to the birth of strong calves.

There are probably some other causes of weak calves, but the four listed are the more important ones. With the major causes established, dairymen can probably do something about insuring stronger and healthier calves. Let's see if those things to be done are all concerned with prevention. For the sake of convenience they can be grouped in a program divided into four parts corresponding to the big causes of weak calves.

1. Herds can be regularly blood tested for the detection of Bang's disease and vibrionic abortion. If infected animals are discovered, control measures can then be instituted before many weak calves are born. Nor should blood testing be omitted just because there haven't been any recent abortions in the herd. Infection sometimes exists without obvious symptoms, and herd test results are frequently surprising. Tests for Bang's disease and vibriosis are made with different antigens, but the same blood samples will do for both.

2. Plenty of leafy, well colored roughage can be fed to pregnant cows in order to help insure plenty of vitamin A in their rations. If such feeding is not enough to prevent the appearance of weak calves, vitamin A can be given in capsules. Present day information calls for giving each cow 500,000 units of the vitamin twice a week during the last three weeks of pregnancy.

3. Dry cows can be fed liberally on balanced rations of good feed to supply plenty of protein for the development of unborn calves. There is no standard ration that will apply in all cases, for cows have individual differences the same as people. Generally speaking, though, a grain mixture of half corn or barley, and half oats will do for cows that have good legume hay. When the roughage is of poor quality, something like linseed oil meal will be needed for bringing the grain mixture up to at least 16 percent protein.

The amount of grain to be fed will be governed by the condition of the cow. One that dries off in fairly good flesh will probably do all right on two to four pounds daily if she has good roughage. One that has "milked down" and is really thin at drying off time will need six or eight pounds daily or may be even more. An exception can be made in the case of dry cows that are on good pasture for they'll probably need no additional feed. In all other cases, the feeding of a little grain to dry cows will help to insure stronger calves.

4. Both iodized salt and a complete mineral mixture can be supplied free choice at all times.

These are best supplied in two separate boxes so they can help themselves to whichever they want without being compelled to eat the other. In addition, it won't hurt to mix in a pound of the minerals with every 100 pounds of the cows' grain rations. In areas noted for an iodine deficiency, cows may be given a few grains of sodium iodide weekly during the last three months of pregnancy. This is easily supplied through the drinking water and is advised because the use of iodized salt may not be enough to ward off deficiency troubles.

What is a 'Hybrid' Chicken?

Condensed from the American Poultry Journal

L. M. Klevay

THE Federal Trade Commission says that in order to advertise a chicken as "inbred-hybrid" it must be "produced by crossing two inbred lines of different breeds or varieties" or be produced by various other combinations of inbred lines. An "inbred line" is defined as having at least four generations of inbreeding.

That definition separates the "inbred-hybrids" from straight breed or variety crosses which in the past have been called hybrids. Just how is an inbred-hybrid chicken produced?

It takes a lot of work and time, in terms of years, to produce an inbred-hybrid. The start is usually made with a sister brother mating to begin the inbreeding. The offspring of this mating are carefully judged for desirable characteristics, and the best are again sister-brother mated to intensify the blood line.

When such close inbreeding is practiced, the good as well as the poor qualities of the line are intensified, and it is not unusual for a line to die off or get discarded after a few years of inbreeding. Some breeders engaged in the inbred-hybrid work have several hundred such inbred lines of several breeds going at once. Sometimes only one pullet chick out of 60 survives the rigorous selection to get into a breeding pen for further inbreeding.

Inbreeding does two things: (1) it concentrates both desirable and undesirable characteristics, (2) it makes the survivors reproduce themselves more uniformly.

Reprinted by permission from the American Poultry Journal, Chicago, Illinois, February, 1951

Inbred families tend to resemble each other in appearance as well as in performance.

As soon as inbred lines are available, they are crossed with other inbred lines to find matings that "nick." This crossing may be done experimentally after only two years of inbreeding, but it is more likely to be done when the line has been inbred to a 50% or higher co-efficient of inbreeding or 3 or 4 generations. The progeny from these test matings are carefully tested for all desirable characteristics. Those that do not measure up are discarded. Few matings "nick" and produce good offspring.

When two lines are found to "nick", it may be that line A contributes fast growth, good egg size and fast feathering. Line B may add high winter egg production and good shell texture. The offspring of this A x B cross are then bred to C x D cross that adds still more good points to the line.

The first cross is called a single cross and is usually within its own breed, that is White Leghorn on White Leghorn. The second cross, when two single crosses are combined, is usually a breed cross as well. The two most popular breeds used at present are White Leghorns and R. I. Reds or New Hampshires. Usually a White Leghorn male is used on Red or Hampshire hens to get an almost white chicken of good body size.

When two lines are found to "nick" and it is decided to use the lines in a commercial cross, the breeder proceeds to multiply his lines. This is done by making as many inbred matings within the family as possible. Because the line has been inbred to a high degree of uniformity, even cousin matings will produce offspring with all or most of the desirable characteristics that were intensified in the line. Thus it is possible to produce mass matings and from these to increase the output to the point where millions of chicks with the blood of four inbred families in their veins, can be sold to poultry raisers.

All this takes a very large investment in houses, labor, land, record keeping, and time—years of time. One of the large inbred-hybrid breeders has many testing farms in several states for testing the experimental "nick" matings. As many as 300 such matings are tested each year, and the total number of birds being tested runs well into the thousands. Some hybrid chick producers test these matings on their own home farms.

The second step — the 4-way cross, where two inbred lines on the male side are crossed with two inbred lines on the female side, produces the commercial inbred-hybrid, but before it is sold to the public, it, too, is tested under field conditions. One breeder tests up to

250 crosses involving more than 100,000 pullet chicks a year.

Culling, testing, proving, eliminating cuts all these lines from the hundreds tested to a few retained. Most of the breeders of inbred-hybrids have only a few successful commercial lines for sale. They give these commercial lines numbers the way hybrid corn breeders number their seed corn varieties. Whenever a new and better line is developed, it is either added to the lines sold or replaces one that is considered not good enough anymore.

So far most of the emphasis has been placed on producing inbred-hybrids for egg production, but several breeders are working on meat crosses too. As a matter of fact, some inbred-hybrid broiler crosses are already on the market. Without doubt, inbred-hybrid broiler chicks will soon be available in quantities comparable to the egg bred lines.

These are some of the characteristics the Inbred-Hybrid breeders select for:

Early maturity	Non-broodiness
Excellent shell quality	High rate of lay
	High livability
Freedom from blood and meat spots	Desirable egg color
	Good egg shape
	Early feathering
High fertility	High hatchability
Large eggs	Rapid growth

This diagram shows how the inbred lines are combined to make hybrid chickens. The characteristics shown for each line are merely samples and may not occur in that combination.

INBRED A—Carries resistance to colds — high rate of production. good egg size—high winter production and other good qualities.

INBRED B—Carries good summer production — early maturity — good egg shell quality — quick feathering and other good qualities.

SINGLE CROSS Carries the combined good qualities of inbred lines—A and B.

INBRED C—Carries steady egg production, non-broodiness—good livability — early feathering and other good qualities.

INBRED D—Carries resistance to colds—high winter production—large egg size—good interior egg quality and other good qualities.

SINGLE CROSS Carries the combined good qualities of inbred lines—C and D.

FINAL CROSS This is the hybrid chicken that is sold to farmers. It carries the good characteristics of four inbred lines. Like hybrid corn it will not breed true.

Broom Sedge and Tickle Grass Come In, When Soil Fertility Goes Out

William A. Albrecht, Chairman
Department of Soils, University of Missouri

IT IS becoming a common complaint that "Broom sedge and Tickle grass are taking our pastures." Others say, "Those weeds have moved in from the South." All this has happened in spite of statutes against the spread of noxious weed seeds.

Broom sedge has come into prominence, especially as a left-over for winter notice, because the cows refuse to eat it. Tickle grass comes under the same category. That refusal has been the cow's way of telling us that such plant growth does not deliver enough feed value to pay for the trouble of eating it.

Sanborn Field, at the Missouri Experiment Station, is giving its wise answer to the question of how to get rid of these noxious plants. It tells us clearly that Broom sedge and Tickle grass have come in because the higher level of soil fertility required for more nutritious feed plants has gone out. Rebuilding the soil is the answer.

Pasture farming with continuous grass must already have been in the mind of Professor J. W. Sanborn when, in planning this now historic field, he included two plots of continuous timothy. One has been given six tons of barnyard manure annually, the other no treatment, ever since the field was started. The manured plot has always been a fine timothy sward with early spring and late fall growths, and a quality hay crop of two and one-half tons every summer. The one with no treatment has been getting so foul with growths other than timothy as to require plowing and reseeding about every five or six years. This called for the same treatment, for uniformity's sake, of the companion plot, even though weed-free. Broom sedge soon takes over the no-treatment plot as the major trouble maker.

These plots tell us that the trouble is not in the particular "invading power" of the Broom sedge, even if its fluffy, wind-borne seeds travel profusely and go everywhere. Both plots are equally invaded by the seed of this pest. However, Broom sedge appears on only the untreated plot, cropped to poor hay now

much of the time. It grows right up to the soil line dividing these two plots. It does not cross that border. None has grown on the manured plot, always covered with a dense growth of good timothy. Other plots equally as low in soil fertility on this field are gradually being taken over by Broom sedge. Those with higher levels of productivity are free of it.

Sanborn Field says "Fertilize the soil so it will grow grasses that make nutritious feed and these troublesome plants of no feed value stay out." Poverty bluestem, as Broom sedge is sometimes called, is a mark of the kind of farming that fails to consider the fertility of the soil as the foundation of it. This pest has been coming more and more into what has been "pasture farming" because past cropping to grass without soil treatments has brought the fertility down to where crops of feed value are failing and only those woody growths like this poor bluestem of cow's refusal are all that can be produced.

Tickle grass is also invading Sanborn Field. It has been taking over the last half of the six year rotation of corn, oats, wheat, clover, timothy and timothy where no soil treatments are used. The plots alongside, given manure, phosphate, and limestone, are free of it right to the straight line separating the plots and treatments. This poverty grass means poverty of soil fertility and thereby poverty in crop output of yields and of nutritional values. No other crop can grow luxuriantly enough on such low fertility to drive this pest out.

This weed has come in when the rotation was as long as six years. This is one claimed by some to be helpful for better yields and crops. It certainly has not been such. It has simply rotated the fertility of the soil out so much faster, that Tickle grass now comes in as major cover during those three years when there ought to be clover and timothy. These crops requiring no plowing have been rotated out and Tickle grass has been rotated in.

Chemical analyses of these pest crops confirm the suggestions by the cow and Sanborn Field. As pounds per ton, Broom sedge contained 2.14 of calcium, 2.18 of phosphorus and 88 of crude protein. For Tickle grass the corresponding figures were 3.04; 1.9; and 69. In marked contrast for a mixture of clover and grass from fertile soil and at similar growth stage the corresponding values per ton were 26; 4; and 181 pounds.

Nature's pattern of different crops growing on different places is the pattern of different levels of soil fertility nourishing them and

correspondingly a pattern of different feed values in them. Declining soil fertility is pushing some crops out and letting others come in. According to these simple soil differences, then, we can drive out Broom sedge and Tickle grass by lime and other soil treatments offering better nourishment for better crops that will keep these pest crops out. That Broom sedge and Tickle grass should go out when you put soil fertility in is merely the converse of the fact that they come in when the fertility goes out.

Modern Wheat Production

Condensed from Indiana Farmers Guide

George H. Enfield
Extension Agronomist, Purdue University

THE ancient wheat crop needs modern treatment to keep it from becoming a displaced crop. The average wheat yield in the United States is only 18 bushels per acre. Even in the breadbasket states of the Middle West the average yield is less than 20 bushels. With just a few changes, wheat can become an important cash crop.

The introduction of soybeans to the rotation has brought about changes in wheat production. Prior to soybeans, corn was cut in shocks and the soil was disced or the oats stubble field was plowed and a late summer seedbed was prepared for wheat. Now soybeans are combined and the wheat is often sown on an unprepared seedbed. In southern Indiana some of the farmers plant early varieties of corn which are harvested and the whole stalks are disced for wheat. These changes in seedbed preparation make it necessary to revamp some of the old seeding and fertilizer practices.

It is necessary that we plant from six to eight pecks to the acre. Wheat on the unprepared seedbed gets a poor start and it is often planted later. This allows less time for the plants to "stool" or "sucker out" in the fall. Good fertilization and a full rate of seeding are two practices that will help to avoid poor stands due to late seeding.

The recent changes in wheat production call for more nitrogen in the fall fertilizer. After a crop of soybeans, even though they are combined and the straw left on the land, it has been found that at least eight to twelve pounds of

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nitrogen are needed to give the wheat the start it got when grown in a prepared seedbed following oats. The roots of the soybeans are woody and need additional nitrogen to permit them to decompose rapidly.

The practice of seeding wheat following disced corn stalks increases the need for nitrogen in the fall fertilizer. Many farmers expect a poor wheat crop if corn stalk land is used. But, some of them do not realize that the addition of extra nitrogen from either manure or fertilizer will reduce or remove this bad effect.

Tests have shown that wheat needs an abundant supply of available phosphate within reach of the tiny root system after germination. Trials in Indiana have shown that it takes between 50 to 60 pounds of P_2O_5 per acre applied through the fertilizer attachment of the drill to supply the amount needed. This is the amount of phosphate found in 400 to 500 pounds of fertilizer containing a 12 percent P2O5, such as a 3–12–12 fertilizer. The other time when a large amount of available phosphate is needed is when the head is forming or the plant begins to bloom.

Wheat is usually able to get all the potash it needs to produce a good crop if it is planted on a soil containing a medium level of available potash. On very potash deficient soils the yields can be increased 10 to 20 percent by the addition of fifty pounds of potash with the fertilizer at planting time. For this reason, common wheat fertilizers recommended in Indiana are 3–12–12 and 4–16–8.

Seed only clean wheat. Nearly all the cracked and damaged kernels of wheat can be removed by cleaning. A large part of the cost of cleaning can be paid for by saving the cleanings for feed. Cleaning removes the shriveled weak kernels that are often slow to germinate along with the chaff and short straw that sometimes plug up the drill and cause skips in the seeded wheat field.

Each year wheat fields are infested with stinking smut. This disease is seed borne and can be controlled by treating the seed with one of the treatments such as the new improved Ceresan. This also reduces the amount of seedling blights. The treatments only cost about two cents a bushel and the prevention of stinking smut is worth many times the cost of the treatment.

Where farmers do not have equipment for properly storing, cleaning and treating their seed, it is often just as profitable to buy cleaned and treated seed of an approved variety from some local seedsman. This is especially true where the acreage is small and the farmers must depend on custom combining, because this is a good place to get mixed seed and con-

tamination of weeds and wheat diseases.

Nearly every farm has some light colored soil and wheat on these areas needs a boost in early spring by added nitrogen. Wheat seeded after corn needs a spring tonic of available nitrogen. The spring nitrogen should be applied just as soon as the growth starts in the spring. It is not necessary to work it into the soil because a surface or broadcast application is all that is necessary, but it must be applied evenly.

If ammonium nitrate is used it should be applied at the rate of 80 to 100 pounds per acre, or 65 to 75 pounds where wheat is used as a nurse crop for legumes. Calcium cyanamid and ammonium sulfate, the other two common nitrogen fertilizers should be applied at the rate of 100 to 150 pounds per acre. This additional supplemental nitrogen in early spring usually increases the yield from 4 to 12 bushels per acre. Where the expected wheat yield, without nitrogen is to run 30 or more bushels, the top dressing should be omitted because it may cause the wheat to mature late or even lodge. This type of treatment will cost about four dollars for the material and it should be applied for a dollar per acre. Wheat at two dollars per bushel makes it possible for the user to double his money in less than six months.

Straight nitrogen fertilizers suitable for top dressing are abundant during the summer and fall, but are always scarce in late winter and early spring. The wise wheat producers are making it a practice of buying their top dressing nitrogen in the fall and taking delivery when they can get it.

Spittlebug Control

Condensed from Ohio Farm and Home Research

C. R. Weaver

In the spring of 1950, low volume sprayers were used to treat 60- to 70-thousand acres of clover and alfalfa meadows for spittlebug control in Ohio. Seventy percent of all the acreage treated in the state was treated with these "weed" sprayers.

Prior to the 1950 season, little detailed knowledge of the best utilization of such sprayers for spittlebug control was available. The practical experience gained in 1950 with this equipment will enable many farmers to do a better job of spraying this season. Fur-

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thermore, research at the Ohio Agricultural Experiment Station during the past year has provided information that may lead to more efficient utilization of low volume equipment in the coming seasons.

To gain the greatest benefit from low volume applications of insecticides to control spittlebug nymphs, treatments should be applied early when the clover and alfalfa plants are only 4- to 6-inches high. In experimental control work, low volume applications made after the clover was 8 inches high were not nearly as effective as those applied earlier. The failure of farmers to treat their fields early enough was the greatest cause for poor or mediocre results from treatment of spittlebugs in 1950. Young spittlebugs appear in late April or early May when the clover is just beginning new growth. Applications made at this time give better coverage of the crowns of the plants where the young insects congregate and the bugs are killed before they have done much damage. Delay in application will not only result in inferior control but also will increase the likelihood of an insecticide residue on the finished crop. Insecticidal residues on forage crops are a potentially serious hazard and every precaution should be taken to keep such residues at a minimum.

During the 1950 season several comparisons were made of low and high volume equipment for spittlebug control. High volume sprayers delivering 100 gallons or more per acre at high pressures were extremely effective in every case. Low volume applications were equally effective when the clover plants were small.

The low volume application does not need to be made with high pressures. Pressures from 20 to 40 pounds per square inch are most satisfactory. The use of high pressures with low volume equipment results in the breakdown of the spray material into fine particles that are more subject to drift. These drifting particles do not give coverage of the crown of the plant as effectively as the larger particles that are delivered at low pressures. Pressures of 100 pounds or more with 5- to 10-gallon per acre applications are not recommended.

The volume of spray that a sprayer will apply depends primarily on three things: the pressure used, the speed with which the sprayer is driven over the field, and the size of the openings in the spray nozzle. The "weed" nozzles in common use today deliver 5 gallons of spray material at 30 pounds pressure when the tractor is driven at 4 m. p. h. This combination has been used extensively for spittlebug control. Those farmers who wish to continue the use of this combination should be sure to apply the spray shortly

after the spittlebugs are found in appreciable numbers and while the clover is small. As the plants grow larger, however, a larger volume of spray material is required. Ten gallons per acre is a preferable amount to use and when the application is delayed the higher gallonage is essential.

There are two ways to increase the amount of spray material delivered. The tractor speed can be reduced or nozzles with larger openings can be installed. Since reducing the speed increases the time required for spraying, the use of larger nozzles provides the better solution. Nozzles are available that will deliver 10 gallons per acre at 30 pounds pressure at a tractor speed of 4 m. p. h. For best control with low volume equipment this combination is recommended. The disadvantage, of course, is that twice as many trips must be made to get water for the sprayer. Farmers whose farms are not equipped to provide large amounts of water quickly will probably prefer the 5 gallon rate but must be satisfied with less effective results, especially when the treatment is delayed.

Liquid formulations of benzene hexachloride which are used in low volume sprayers were in short supply in Ohio in 1950. This was largely a result of an unexpected demand for the insecticide for spittlebug control. In the spring of 1951, better supplies are expected to be available although the price may be somewhat higher.

A disadvantage of employing weed sprayers on meadow crops is their primary use for weed control applications of 2,4-D. The effect of residues of 2,4-D in weed sprayers converted to use on clover and alfalfa was largely unknown prior to the 1950 season; however no damage to hay crops from this source has been reported. After a season's use of 2,4-D in a weed sprayer precautions should be taken to clean the sprayer thoroughly before using it for insecticide applications to meadows. A spray tank used for weed killer should not be used for insecticides for spittlebug control.

All Pullet Flock Takes Over

Condensed from Poultry Tribune

W. R. Whitfield
Iowa State College

WHEN Iowa poultrymen were introduced to the all-pullet flock program in 1945, only about 15 percent of the poultry raisers were using it.

Now, five years later, over 65 percent of all laying flocks in the state consist of birds under one year of age.

This is a remarkable change, especially in a state that has been noted for having the largest number of hens, and also having the largest proportion of farm producers in the United States. There is little doubt that the number of all-pullet flocks soon will be close to 100 percent. In fact, producers now keeping old hens are doing so because they either failed to start pullets last spring or they bought someone's old hen flock this fall. There is no longer any serious objection to the all-pullet flock plan.

Weighing the advantages of this program, we can see why. It benefits every group in the poultry industry from producer to consumer. The producer can expect to increase his egg production about 30 percent. The additional eggs are laid mainly in the fall when prices are higher. The extra cost of raising the pullet is no greater than carrying the old hen through the molt.

As a result of this sound management practice, hatcherymen sell about 25 percent more chicks. This gives the farmer enough pullets to fill his hen house in the fall. The produce buyer gains, too, because there are more old hens for him to buy. These are some of the reasons why all segments of the industry pushed the program and made it a success.

The title of the program is confusing to some people. The implication is that the flock owner should buy only pullets, and this has been interpreted by some as an intentional effort to reduce the purchase of cockerel chicks by farmers. Although this is not the case, the recent broiler developments in other areas found Iowa producers ready to relinquish the soft-meat end of the poultry business.

Perhaps other states would not

Reprinted by permission from the Poultry Tribune,
Mount Morris, Illinois, February, 1951

have benefited as much as Iowa from the program. Iowa has several special reasons for needing a strong stimulant to mature the poultry industry. Ten years ago, the average production per hen in Iowa was only 124 eggs. This was 10 eggs below the national average. Another reason was the generally low fall egg production and heavy laying in the spring. This led to egg surpluses, followed by an egg storage problem. As a result, fewer eggs were used because of poor quality and flavor.

And, finally, Iowa had the highest incidence of the avian type of tuberculosis in poultry and hogs of any state, averaging more than 7 percent for the entire state. The general lack of interest in the poultry enterprise among farmers also was widespread, and efforts to generate good management programs were almost in vain.

The all-pullet flock program cannot be given full credit for all the accomplishments made by Iowa poultrymen in the past five years. Yet, no one can dispute its importance. Furthermore, it was indirectly responsible for other developments among farm producers such as better housing, full confinement of the laying flock, use of deep litter, and other good management practices.

These combined influences are helping the poultry industry in Iowa to weather the storm of competition. At the end of five years in which the all-pullet flock program has been promoted, the annual egg production per hen in Iowa has risen from 156 eggs in 1945 to 175 eggs in 1949. During this same five-year period, Iowa averaged 166 eggs per hen, or about 10 eggs more than the national average.

Iowa has made a 43 percent gain since 1940, while the country as a whole made only a 21 percent gain. However, the largest plum in the pudding was in the gain in fall egg production and a bigger income from market eggs. This not only raised annual returns, but it stabilized the per capita demand at a new level because more fresh eggs were being marketed. Only pullets can lay a large number of fall and winter eggs because hens molt as the days shorten, and this takes about three months time.

The all-pullet flock program has helped Iowa to break the long record of low fall egg production. In September, 1943, the state ranked seventeenth in egg production. This past September, it ranked eighth. Pullets have pulled Iowa's fall egg production out of the low spot for the first time.

Control of the avian type tuberculosis is another major victory. In the early 30's, the U. S. Department of Agriculture reported Iowa as the only state in the na-

tion having more than 7 percent of avian tuberculosis in poultry flocks.

In 1946 when Dr. C. D. Lee, extension veterinarian, Iowa State College, began working on the problem in cooperation with the Bureau of Animal Industry and the State Department of Agriculture, he found the figures for the prevalence of tuberculosis in old birds, as reported by earlier investigators, to be practically unchanged. For example, his findings in a 25-flock sample in 1949 show there was 20 times as much tuberculosis in old hens as in birds under one year.

More important, however, was the change by farmers to all pullets. During 1946–49, Dr. Lee, the bureau and the state department veterinarians tested 468 flocks in 13 counties. It was found that 169 were all-pullet flocks and 299 were mixed or old hen flocks. When these same flocks were checked in 1950, there had been a general change to the all-pullet flock. Out of the same 468 flocks, 400 were all-pullet flocks and the rest were mixed or old hen flocks.

He also found that hog herds which were running with mixed pullet and hen flocks were more likely to have the disease than when the flock was all-pullets or when the flock was confined all year, another practice that needs encouragement among Iowa farmers.

Comparison of results at all interior markets in Iowa point out that Iowa also has done an excellent job of reducing avian tuberculosis in swine. Retention hogs now average about six percent, whereas 10 years ago they ran over 10 percent. Other states that have not adopted the all-pullet flock program are still troubled with a much higher incidence of this disease.

Keeping basement windows open in summer is responsible for most wet basements, according to an Iowa State College extension agriculture engineer. Windows are opened in an effort to dry out the basement. The result, however, is warm outside air striknig cool walls causing water condensation. The engineer recommended keeping basement windows closed, except during cool dry days. Cool, dry air circulated through the basement will not cause condensation and will remove dampness in a day or two.

Free Martins—Breeders or Non-Breeders?

Condensed from the Hereford Journal

L. P. McCann
American Hereford Association

Is it possible to find out at an early age whether or not a free-martin heifer will reproduce? Breeders everywhere are interested in this question because they do not want to sacrifice an animal that may have high potential value as a breeder. On the other hand carrying such an animal for an indefinite period is always open to question, particularly in view of the fact that only about one in nine of such heifer-appearing individuals will be normal and reproduce.

Dr. Leonard W. Goss, professor emeritus of veterinary pathology at Ohio State University, Columbus, gives an affirmative answer to the above question and he further states that it is not at all difficult, and that it can be done any time after the birth of such animal.

The free-martin, is the name applied to a heifer born twin to a bull, and breeders have long known that the majority of such heifers never breed. A very few of these develop such masculine-appearing features about the head and other parts of the body at an early age that they can be recognized and discarded, but the number that are easily recognized for their non-feminine character are few. By far the great majority appear just as normal as do any other heifers of similar age, except that as they get older the normal heat periods do not recur in the free-martin. Slaughter, of course, will always reveal the answer by a careful examination of the reproductive organs. If a mistake has been made, however, it is then too late to correct it, so an early diagnosis in the living animal is highly important.

In the embryo development of most types of twins other than cattle, the blood supply flows to each individual separately, whereas in cattle the blood flow becomes fused during some state of the embryonic development with the result that the same blood flows into both fetuses in the case of twins. Where both calves are of the same sex, this makes no difference and in the case of opposite sexes the male is not affected. However, in the embryo

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state it appears that the male sex organs develop more rapidly than the female organs. The resulting male hormones that are thereby produced pass into the common blood stream and in flowing through the female twin inhibit or slow up the development of her reproductive organs. The result is that at birth such a free-martin heifer lacks a fully developed reproductive system.

Doctor Goss states that a competent veterinarian, by the use of a vaginal speculum, not more than twelve inches long and from one-half to three-fourths inch in diameter can readily determine the true condition. The suspected heifer, if a true free-martin, will have a vagina of only one-third normal length or about two to three inches long when the heifer is young. The tapered ending of the vagina may have blind pockets and there is no continuation of these parts as in the normal heifer. After the use of a speculum, post-mortum examination will throw added light on the true condition.

Put the Bee on Legumes

Condensed from the Nebraska Farmer

Jim Boan

Bees are worth more to pollinate legumes than for the production of honey and beeswax combined.

For each dollar the beekeeper receives for honey, the legume seed producer gets $15 to $20 worth of pollination. Last year in Nebraska, 22 thousand acres of sweetclover, 16 thousand acres of red clover, and 100 thousand acres of alfalfa were harvested for seed.

Nebraska alfalfa, for example. yielded more than a bushel of seed per acre, or a 7,200,000-pound total. Using bees for pollination, this yield could be increased to 15 million pounds, boosting alfalfa seed income $5 million—an average of $45 for every Nebraska farmer. And alfalfa is only one crop!

The Kansas Agricultural Experiment Station has developed this formula as a basis for cooperation between beekeepers and seed producers: 1 colony of honeybees plus 1 acre of alfalfa equals 120 pounds of seed plus 53 pounds of honey.

The formula was figured something like this: A colony of 10 thousand worker bees, working 10 hours a day during the 20-day

Reprinted by permission from the Nebraska Farmer
Lincoln, Nebraska, January 20, 1951

alfalfa blooming period, can visit 871 million florets and pollinate enough plants to produce 120 pounds of seed per acre. Also, the bees would carry 30 gallons of nectar from the field. This would be enough to store 53 pounds of honey, in addition to that consumed by the living bees.

Since 30 gallons are only 28 percent of the total nectar in the plants, it is possible for an acre of alfalfa to support three colonies of bees, producing a total of 360 pounds of seed and 159 pounds of table honey per acre.

During the past 25 years there has been a gradual decrease in legume seed yields. Wartime demand for grain and fiber crops reduced the normal acreage of legumes for seed. The postwar shift to livestock farming caught seed suppliers with bins nearly empty. Early in 1950, U. S. farmers planned to seed 100 million acres to grass and legumes, but enough seed was available for only 55 million acres—45 million acres short.

Fortunately, every farmer or commercial seed producer can do something to prevent this shortage from lasting.

Alfalfa and most clovers and other legumes require insects for their posterity. Four or five colonies of bees per acre are needed for complete pollination, more than would be profitable for honey production. However, one colony per acre will increase seed yields greatly.

Red clover seed yields were tripled by honeybees in an Iowa State College experiment. Where there were no bees, yields averaged about a bushel an acre, but within honeybee flight distance the average yield was four bushels an acre. Bees do best within one-fourth mile from the stand, but increase seed yields up to four miles away.

One can't appreciate honeybees without knowing the tremendous job they do.

A colony of bees may have 10 thousand or more workers. An acre of alsike clover will have 400 million florets. With one bee colony to the acre, each worker would have to visit nearly 40 thousand florets while they are in bloom. Even if this were posible, fertilization would not be 100 percent.

Pollination isn't as easy as getting a bee into a floret. Both bee and flower factors must be considered.

Bees must have pollen and nectar to live. When a bee stops on a flower to gather nectar, it "trips" the stamen which is coiled in the bottom of the blossom. The stamen shoots upward, showering the bee with pollen. Pollen grains are caught on branched hairs projecting from the bee's body, and are carried to the next flower.

This cross pollination produces

vigorous seed, but only a small percentage of the florets visited are tripped.

Bees visit red clover mainly for pollen, and they don't like to crawl around over the burly heads. Nearby fields of white, sweet or alsike clover will attract bees away from red clover. If the first cutting is timed so that the second crop will bloom when other flowers are scarce, large numbers of bees will visit red clover blossoms. Another method is to put colony stands in the middle of red clover or other legume crops the bees find less desirable.

Bees may prefer one alfalfa field to another. Scientists at the University of Wisconsin discovered two clones on a plant were heavy with seed while others "set" little seed. The difference seemed to be an odor, resembling lilacs, inherited from the Grimm alfalfa parent.

Alfalfa "tripping" has varied all the way from .3 to 12 percent of the florets, in experiments. The reactions of modern plants and bees may be an explanation.

Some alfalfa varieties have developed powerful stamens. When the bee trips them he gets knocked for a loop. Wild bees can take it, but tame bees have learned to sneak in from the side and gather nectar without tripping the stamens. So they buzz away without pollen. Under the leadership of Dr. Ephriam Hixon and directed by USDA entomologist, Bliss Crandall, University of Nebraska entomologists are searching for alfalfa varieties with a milder uppercut.

Wild bees are better in many ways than tame bees. They are not so particular about the flowers they visit; and they are hardier, flying in cooler and damper weather. When it's stormy or the temperature drops below 57 degrees F. you won't see bees working. This may be a basis for the saying: "Seed sets best in hot, dry weather."

A lot of people believe bumblebees and other insects do just as much to pollinate legumes as honeybees. The USDA made a three-year study. They found that 82 percent of red clover blossoms were pollinated by honeybees, 15 percent by bumblebees, and three percent by other insects.

New insecticides have taken their toll of valuable insects. Not only do DDT and other powerful insecticides kill bees, but poison pollen is stored in the comb for the young. Dr. George M. List, Colorado A & M College, gives this reassuring note: Bee population drops off sharply after a field is sprayed with DDT. They're not killed, but smart enough to stay away for a few days until the insecticide has lost its toxicity.

The very existence of some legumes is dependent upon insects. Alsike, medium red, white Dutch

and Ladino clovers are all nearly self-sterile, consequently dependent upon insects for cross pollination.

Often the honeybee is wrongfully blamed for not doing his job. This is particularly true with sweetclover and other legumes where seeds shatter easily during harvest. If the crop is overly mature or the weather extremely dry, much of the seed may be lost. Then the farmer complains to the beekeeper.

In addition to more than 30 seed crops, the USDA names a score of fruit crops pollinated by insects. Honeybees do more than 80 percent of this job. Most of these fruit and legume-vegetable crops are consumed directly by humans. Other bee-pollinated legumes, mostly field crops, are important meat and milk producing foods, as well as soil builders.

However, many specialists believe that with more bees, a better alliance between beekeepers and farmers, and with improved home seed harvesters we ought to bound out of the seed shortage doldrums. Already apiarists have started a movement toward standardizing bee inspections for inter-state shipment, and experimenters have found ways to increase worker bees in a colony to 80 thousand under one queen. If we do our part, we know we can rely on the honeybee to deliver the golden pollen nuggets. His life depends upon it.

Plant Corn Under Cover

Condensed from Capper's Farmer

M. N. Beeler

A NEW kind of corn planter has been invented. It is a combination tool which tills and seeds in 1 operation without covering mulches, living or dead, that may be on the land. So it's a soil saver, a labor saver and a cost saver.

With this machine, rotation meadows and winter crops can be allowed to stand or old crop residues can be left right up to planting time. Then a seedbed can be worked up under stalks, stubble, straw, trash or sod. Enough mulch will be left to check runoff or wind damage.

About 90 percent of all erosion occurs during spring rains. Land that remains covered loses little

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of its topsoil. But under ordinary practice, farmers must begin plowing and working seedbeds early to get the job done. That exposes fields to washing or blowing during April, May and June. The mulch tillage planter permits putting the crop in and keeping the cover until after the first, second or later cultivation.

This machine, developed by Internationl Harvester Company, is a 2-row outfit. Its dual tillage units are mounted between front and rear wheels. Each is made up of a 30-inch sweep which follows a notched coulter. This coulter is bracketed by toed-in flange wheels which press trash or sod down for positive cutting. They also serve as gage wheels to regulate tillage depth.

The big sweep runs 2 to 2½ inches deep to cut off roots of alfalfa, sweet clover, red clover, grass, small grain or stubble. Five inches below it and set slightly backward is a narrower sub-sweep which loosens the soil to usual plow depth of 7 or 8 inches. Behind the sweep shank is a fertilizer boot which follows the sub-sweep to afford deep plantfood placement. Trash bars and clod fenders clear the seedbed. A trailing section of rotary hoe completes the tillage.

Planting units, similar to the ordinary kind, are mounted on the rear of the tractor. They track the tillage assembly. Each is equipped with side-dress fertilizer attachment, shoe openers, covering disks and press wheels. Furrow opening disks may be fastened alongside the shoe if necessary to push clods away.

Said George E. Pickard, Illinois engineer, who has been testing the machine: "Rows are spaced 40 inches apart. The 30-inch sweeps therefore leave a 10-inch band undisturbed in the middles. This hard strip, with whatever may be growing in it, can be left to check washing until the period of heavy rains is past."

Three small sweeps on spring shanks are fastened to the planter frame. They may be let down to cut out the 10-inch middles as planting proceeds. Or the middles may be worked and the mulch destroyed at any cultivation.

R. R. Poynor, Internationl research engineer, said development of the tillage planter was prompted by experimental evidence that surface trash conserved both soil and water. "We feel," he said, "that the method is sound both mechanically and agronomically. Its adoption on sloping fields planted to corn should be helpful in reducing erosion losses and in increasing yields."

R. H. Bray, Illinois soils scientist, believes the planter may be the forerunner of some big changes in farming practices. He and Pickard grew 22 acres of corn by this method last summer with

several kinds of growing and plant-residue mulches.

Five years ago Bray tried out a slit-cropping system in which corn was planted in tilled bands cut thru red clover and sweet clover sods. Altho corn yields were reduced by clover competition, he concluded the slit system might be justified by lower erosion losses and by savings in production costs.

Now another possibility looms. Suppose the strip of green clover in the corn middles is not destroyed by tillage or cultivation. Will the plants come on to mature seed? Maybe so, maybe not. That might depend on the kind of green cover. But if the scheme worked, it would save cost of reseeding and sidestep the need for oats or other small-grain nurse crop.

What would happen to corn yields in that case? They'd probably go down. But extra water and extra nitrogen at the right time might take care of the competition. Bray got 102 bushels an acre in his red clover slits by adding nitrogen; 125 bushels in his plowed strips. When he applied both irrigation and nitrogen, yield was 130 bushels on slit plots; 135 on the plowed. Clover between corn rows was clipped twice to retard growth.

In the sweet clover slits, extra nitrogen boosted corn to 116 bushels an acre compared with 130 on plowed plots. Irrigation and nitrogen put yield up to 131 bushels on the slit plots and 140 on the plowed. First clipping killed the sweet clover between corn rows so it offered no further competition. Bray believes more nitrogen, better timing and placement of the applications might have increased the slit system yields. The red clover plots might have done better with earlier and additional clipping of middles.

Bray's rows were 39 inches apart in tilled slits 13 inches wide. That left a 26-inch covered middle. Since the new planter works all but 10 inches of the middle, competition with the corn for both water and fertility should be lessened.

In his own experiments with the mulch planter, Poynor got definite yield increases. One strip made more than twice as much as an adjoining plowed strip. But Poynor credits the better yields to extra fertilizer, 500 pounds an acre of 8–8–8 applied with the tillage unit, rather than to the mechanical treatment. All strips, both plowed and mulch-planter tilled, had 200 pounds an acre of 3–12–12 starter. Mulch strips were in alfalfa and alfalfa-brome sod, with middles cut out by rear-mounted sweeps. The slit system, now made practical for field operation, offers great promise.

On sandy or otherwise light

soils, sweet clover seems to be a natural for the system. It provides cover during fall, winter and spring when moisture is not critical. After corn is planted, clipping kills the clover but leaves the tops to slow runoff and evaporation.

Pasturing the clover crop longer than usual, maybe right up to mulch-planting time should partly offset any corn yield decreases and combining the plowing, disking, harrowing and planting into one operation will lower production costs. If clipping the middles may replace part or all cultivation, it will make another saving. The mulch should lessen crusting and washouts and thereby avoid replanting from such causes, at least sometimes.

Tillage without turning the land may aid in weed control because the buried seed will remain dormant. Further since the tillage unit leaves the surface course, weed seeds in the upper layers would not germinate so readily as if the seedbed were pulverized. Another possibility is pre-emergence weed killers sprayed on the tilled strip.

What other sod or small-grain crops may be adapted to this system is not yet known. Rotation seedings of ladino, alfalfa, alsike, brome or other grasses, alone or in combinations, might be better than red clover or sweet clover. Southward winter clovers, grasses and small grains might work into the program. Where corn is to follow corn, which is not good practice on rolling land, cover may be provided by rye or winter wheat or early seeded spring grains. Dead mulch material is plentiful. In addition to second-year sweet clover it would include lespedeza and hubam clover, stalks and stubble of corn, sorghums, soybeans, flax and small grains. Others would be crops grown and matured especially for mulch culture purposes, such as in the Southwest where dead cover promotes range grass catches. Then there are disked or subtilled meadow or pasture sods, which are a part of a trashy mulch system of seeding steep land in eastern Iowa, western Wisconsin and in eastern Ohio.

Build Up Humus in Your Orchard

Condensed from Better Fruit

Dr. R. E. Stephenson
Soil Scientist, Oregon State College

MANY of the plants produced on the farm are not wholly marketable. A ton of field peas, which an acre of good soil may produce, may bring the grower $80 more or less for the seed. The straw not marketable, likewise worth several dollars for fertilizer, is frequently considered of no value and is left to rot in a heap, or perhaps it may be burned.

Good farmers who appreciate its value may leave it on the land and extend considerable effort to have is distributed over their fields.

Fertilizing value of pea straw, based upon the market cost of commercial fertilizer, is about $5 a ton for the three elements, nitrogen, phosphorus and potassium. Besides these elements, the ton of pea straw would contain approximately the equivalent of 70 pounds of limestone, a considerable portion of magnesium, sulphur, boron, zinc, copper, and manganese—all important elements of plant nutrition.

Pea straw is one of the less abundant of legume wastes. More abundant are the vetch straws, clovers, and sometimes others. More abundant still, though less valuable, are the nonlegume straws from grains and the several grasses, much too frequently entirely unappreciated and too often burned as the easiest riddance of a nuisance product.

All these products have value for soil improvement not only for the variable amount of nutrients contained, but for other reasons, sometimes equally or more important. Orchard soils almost always receive summer cultivation, a necessary evil, because vegetation must be controlled during the summer season to save moisture for the benefit of the orchard.

Consequently, orchard soils have frequently become depleted in humus, and the structure more or less destroyed. The wet, sticky clay then dries down to a cemented condition that is unfavorable to tree root development and functioning.

Humus value of waste straw applied to an orchard is considerable, perhaps at least half as great as the fertility value. The straw can be used for mulching to finally become partially incorporated into

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Portland, Oregon, November, 1950

the soil at cover crop seeding time as the land is prepared for seeding.

If a considerable portion of the straw is left continuously on the surface, no harm is done. In the spring the cover crop and part of the remaining straw may both be worked into the soil. Perhaps such a treatment, if not feasible as a yearly practice, could be made on alternate years, making a rather liberal application of the straw. When convenient, an annual application could be made at a lighter rate.

As these organic treatments contribute to the humus content of the soil they are supporting a living population composed of both lower forms of plants (bacteria, fungi) and animal organisms (various insects, earthworms and others) so important to maintaining soil properties that are most favorable to crop production.

The living soil population is responsible for much pore space development, especially the larger pores (open spaces) through which water penetrates into the soil and the excess is removed in the drainage to provide aeration and a renewal of the oxygen supply to support healthy functioning tree roots.

Even sawdust, which has practically no fertility value, has proved helpful to mellow and open tight soils, to bring about more of the desirable porous sponge-like structure. Structure improvement alone on soils that are heavy and disposed to cement into a hard, compact mass, will justify the use of all available organic materials of which the straws are most abundant.

No other treatment is as effective for improving soil structure as the addition of organic materials. Chemicals are mostly ineffective for the purpose except as they are used to grow more organic matter in the form of cover crop roots, green material or straw to go back into the soil for improvement.

Mother Nature covers the earth with litter, weeds, grass, leaves, and other waste year after year, which protects the soil and supports soil life, until the finest type of natural seedbed (a place for plant roots to grow) results in a superb cover of grass or timber.

Man with all his wisdom has seldom managed soils well enough to improve much upon nature's handiwork, and too often there is sad deterioration of important properties of soils long kept under cultivation. Except by accident (such as lightning fires) nature does not destroy the surface protection afforded by a litter cover, nor does she deplete the humus supply by leaving bare fields exposed to the weather for long periods where erosion and leaching losses may be severe.

The natural cover for the virgin

soil is a mixture of living and dead plant material under which treatment soils have improved rather than deteriorated in productivity.

For the orchard, straw, and leaves from the trees, may furnish dead plant material, and a cover crop will furnish living protection to save and improve the soil. Additional fertilization of the orchard may be necessary for a time, but experience has proven that the addition of straw to an orchard over a period of years may result in such improvement that additional fertilization is not needed.

Straw adds some fertility, a cumulative process, and the rotting mass of green and mature plants where cover cropping is practiced unlocks some of the relatively large reserve of nutrient elements of the minerals that are present in all soils.

Sale of fruit is not exhaustive of fertility since fruit is mostly water and products synthesized from water and air through the help of sunlight that activates the green foliage. A ton of apples, for example contains scarcely 50 cents worth of fertility even at present high prices though the product may bring more than $100 on the market.

The bad feature of fruit production so far as the soil is concerned is the necessary tillage which destroys humus, breaks down structure, and sometimes results in serious erosion and leaching.

Though nearly any plant residue will contribute something to humus renewal and soil improvement under good management, there is a great difference in the composition and quality of such materials, and the composition influences their behavior in the soil.

Green growth while young and succulent is relatively rich in nitrogen and rots quickly—too quickly to make much humus. Dead, ripe coarse straw by contrast is low in nitrogen and high in lignin and cellulose which are slow to rot. The coarser stalks of weeds become so woody that rotting is very slow, although not as slow as for sawdust which is mostly lignin and cellulose. A mixture of green succulent grass or clover and dead woody straw is a good combination.

Lime on acid soils, and some source of nitrogen on all soils, will speed the rotting process of low nitrogen straw and at the same time prevent any depressing effect from the presence of the straw in the soil. A sack of ammonium sulfate or its nitrogen equivalent for each ton of straw returning to the land is a good general rule.

This will furnish about the necessary nitrogen to cause the straw to rot well in good soils. On poor soils, more nitrogen should be used, especially when it is de-

sirable to stimulate the growth of a crop while the straw is rotting.

Low nitrogen materials have much less depressing effect on fertile soils, sometimes none on the best ones. In fact, straw has been used to retard the growth of plants on overly rich soils where too large amounts of nitrogen were available to overestimate the growth of plants.

Thus both the quality of the soil and the composition of the plant material influence the rotting material on a growing crop. The orchard soil that is well managed and maintained in a high state of fertility will be improved by sawdust which contains perhaps the least nutrient, and the most lignin and cellulose of any materials often available for use.

Lignin is the most abundant constituent of the humus of normal soils. Therefore, products that are high in lignin may have high humus value if balanced with adequate applications of some form of nitrogen.

Humus is so important to the maintenance of orchard soils that no opportunity for renewal should be overlooked.

Put an End to Deer Damage

Condensed from Popular Gardening

With the aid of a new repellent, farmers, orchardists and gardeners can wage a chemical war against ravaging deer and come out on the winning side with no harm done to plants and trees, and no bloodshed either.

Deer herds have increased so rapidly that their depredations have become a menace to crops in some rural and suburban areas. Their increasing damage to property has prompted some states to relax certain points of the game laws to reduce the deer population. Science, however, has long since been aware of the problem, and chemists have been in search of a solution.

Technicians on the staff of B. F. Goodrich have developed a new product known as Good-rite z.i.p. that will stop the systematic looting of deer without injuring them

Reprinted by permission from Popular Gardening,
141 East 44th St., New York, N. Y., November-December, 1950

or the plants. Thorough, world-wide experiments, to determine the practicability, and effectiveness of z.i.p., have been conducted in cooperation with farmers, game wardens, interested state agencies and such authorities as Dr. L. L. Baumgartner of the Boyce Thompson Institute of Yonkers, N. Y.

Dr. Baumgartner's conclusion after a study of the findings is cautious but nevertheless enthusiastic. "From all cases where this repellent was applied, deer were either repelled or their damage appreciably reduced. Where good repellency was not obtained, the reported reasons were usually extremely high deer population or too low a rate of application."

Rain will not wash z.i.p. away and wind will not blow it off. It is, therefore, effective in all weather.

The taste of the chemical is so abhorrent to deer that one application to crops and ornamentals assures immediate protection from browsing. Deer learn quickly that leaves sprayed with z.i.p. are unpalatable. They depart after a few bites and do not return until new growth is extensive.

Good-rite z.i.p. is a paste and must be mixed with water. Recommended proportion of water and paste during the dormant season is one pint to 2½ gallons of water, and during the growing season about half this strength.

For protection during dormant season, one application of z.i.p. soon after harvest is sufficient until spring. Where a heavy winter is expected, it is important to spray before snowfall. During the growing season one application may be enough. When new growth is extensive, however, one or more added applications may be necessary.

At the recommended dosage, z.i.p. is harmless to animals and non-toxic to most plants. Certain crops (carrots, peas, string beans) can be sprayed until blossoms appear, not after; other crops like lettuce and greens of any kind should not be sprayed at all; no crop should be sprayed after harvest.

To date, all but two reports on z.i.p. are positive; the only two returns from abroad are both favorable; most of the returns from the different parts of this country are in and by and large all are favorable.

One New York experiment with four fields lined up on the same dirt road and planted with cabbage and cauliflower is significant. Severe damage occured in the unsprayed field; 40 plants were damaged in the field containing both sprayed and unsprayed plants. "In the two fields containing sprayed plants not a single instance of deer damage was found."

In Maine, where deer are abundant: "Almost 100 per cent repellency was obtained from applications on beans, strawberries, cucumbers, beets and carrots. The initial repellency for deer in potatoes was excellent but after several weeks deer again re-entered the fields." Dr. Baumgarter's view of the second invasion of potatoes is that it could have been prevented by a second application of z.i.p.

Spray was applied to 14,000 grape vines in a California vineyard which suffered periodic raids by deer. Soon after z.i.p. was applied, the deer left for a nearby unsprayed pear orchard. "Deer damage to gardens in the Oakland and Berkeley areas was severe .... Good-rite z.i.p. was sprayed in 22 gardens .... and in no instance, in later checking, was any damage noted to sprayed plants."

Young, dormant peach trees were the subject of a test in western Colorado in a section where visits from hungry deer were regular and where one night over one hundred were noticed. Following spraying with z.i.p., the deer apparently left the locality as only an occasional track was observed thereafter."

Conclusions drawn by Dr. Baumgartner from the extensive tests of the Goodrich repellent are: "Goodrite z.i.p. has satisfactorily repelled deer from farm crops and ornamentals in a series of world-wide tests. It has been only partially effective where natural food has been critically scarce or where deer were confined. One type of application is not satisfactory for all areas and local testing appears to be necessary to determine satisfactory rates and methods of application.

Rabbit Repellent

The Goodrich Company has developed still another repellent, this one for rabbits, called No-Nib'l. This product is a powder which can be dusted or sprayed on plants. It works on both vegetables and flowers. Treated tulips, hyacinths, beans and lettuce were left unharmed in tests.

Missouri Does It the Balanced Farming Way

Condensed from Better Farming Methods

J. W. Burch
University of Missouri

POSSIBLY no two people would define *"Balanced Farming"* as meaning exactly the same thing. In a recent survey, several hundred farm people were asked to say what this term meant to them.

A variety of ideas were expressed, but almost invariably the men and women interviewed said that Balanced Farming included "taking better care of the land" and "a better living for the family." These two objectives go hand-in-hand.

Members of the state advisory committee to the Missouri Agricultural Extension Service define "Balanced Farming" (a Missouri term) as a carefully-planned *system* of farming for the entire farm unit through which the farm family can coordinate the use of various farm and home practices to achieve high production, high net income, the improvement of soil productivity and better living for the farm family.

Clearly then, Balanced Farming includes soil conservation or, better, soil improvement, but only as one of the many related problems which must be solved by the family which makes its living from the farm. It is economic in character as well as agronomic and involves an over-all coordination and balance of all the enterprises on the farm. Balance and efficiency in the home are equally essential. The application of these practices involves the use of much of the teaching of the Land Grant Colleges and Universities through their Extension Services and also of all the other organizations and agencies working with rural people.

The Balanced Farming program in Lafayette county, Missouri, illustrates the possibilities in any county or community. This program started with some demonstrations, established in 1938. By October, 1947, interest and requests for extension help had grown so great that the regular county agent staff could not handle this and discharge all the other extension responsibilities.

Approximately 100 farm families and various local business

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Mount Morris, Illinois, February 1951

firms contributed funds toward the employment of two associate county agents, who, working under the direction of the senior county agent, would devote practically their full time to Balanced Farming with these interested farm families.

These agents helped various families make individual farm and home plans and *then* stimulated the families to put their plans in operation on the farms and in their homes.

By the end of 1949, 162 families had developed plans and were putting the necessary changes in operation. The benefits from these plans are impressive enough to encourage neighbors to start their own plans.

Cooperators in Balanced Farming use six times as much lime and fertilizer as the average in the county, are building 10 times as many miles of terraces, and plow under six times as much sweet clover for green manure.

Last year these cooperating families made the following improvements in their homes:

Septic tanks	18
Bathrooms	19
Remodeled kitchens	21
Storage space added	9
Enclosed porches	4
Improved yards	5
Central heating	11
Utility rooms added	4
New homes	6

While more has been done in Lafayette County than in most Missouri counties, similar programs have been carried on in all the 114 Missouri counties. The Lafayette results merely emphasize the greater accomplishments which can be secured by increasing the local extension staff.

But land improvement is only one of the considerations, and as stated at the beginning of this article, better living for the family is the major objective.

Better living does result from practicing Balanced Farming. Take the Robert Jennings family, for example. They farmed as tenants for a dozen years and in 1943 received aid from the Farmers Home Administration, which financed the purchase of a 120-acre farm. In 1945 they started to practice Balanced Farming.

In four years they increased the carrying capacity of their farm enough to increase their milking herd from 14 to 21 cows. They improved the facilities for producing milk and shifted from a condensery to a fluid milk market. Results are indicated in the following comparisons:

	1943	1948
Gross farm income	2050	10,133
Net worth	2161	12,426
Food preserved	253	859

Prices for farm products were higher in 1948 than in 1943. Actu-

ally 1948 farm prices averaged 50 percent higher than in 1943. The Jennings income and net worth were five times as large. There has been no increase in the acres farmed, but a tremendous change in their productivity through a land improvement program. Net income was increased through better management and balance between all the farm enterprises.

The Charles Schaefers have been just as successful with beef cattle. Like most farmers they were having financial troubles in the early 1930's and through overcropping were losing top soil from erosion. They have been practicing Balanced Farming on their 211-acre farm since 1935.

By late 1949, the Schaefers had built 6 outlets; 47,520 feet of terraces; had limed all the farm; expanded the use of fertilizer by 500 percent; increased the beef cow herd from 15 to 40 head; and their poultry flock from 175 to 300 hens.

More profitable farming paid for the following farm and home improvements—a new poultry house; a new silo; a new double garage; a remodeled modern farm home with completely equipped kitchen, electricity, pressure water system, bathroom, furnace, and fruit cellar; and a new modern home for the son.

The original farm, through Balanced Farming, has paid for these improvements and is supporting two families now much better than one ten years ago.

These two cases are typical Balanced Farming stories. Usually, physical output can be increased more than 35 percent and net income far more.

These accomplishments are being increased steadily each year as the Balanced Farming program is adopted by more Missouri families. Given enough trained leaders to help with planning and subject matter, Missourians will continue to go forward in improved farming, which not only provides more enjoyable living but a permanent soil foundation.

We believe that the key to soil improvement lies in the desire of every good farm family for gracious living. To have this they must have more income which calls for proper handling of the livestock, production of increased crops, especially pasture, and that requires soil improvement. These economic improvements, however, do not provide gracious living. It, too, must be planned, for it is a definite part of the Balanced Farming program of Missouri.

Future Problems for the Purebred Breeder

Condensed from The Sheepman

L. S. Pope
Oklahoma A. and M. College

WHILE the farm flock owner is prone to think of wool as making up such a small part of his annual income as to warrant little attention, a recent survey showed that the top 10 producers sold $1.00 more wool per ewe than the average sheepman. Year after year, such profits mount up. There are no experiments to show that a ewe which shears a heavy fleece cannot also wean a heavy lamb—in fact, the reverse is true. To obtain the most from the wool clip, requires protecting the ewe against malnutrition while she is heavy with lamb, taking better care of the fleece at shearing time, and marketing the farm clip through a "wool-pool" whereby small lots of wool can be expertly sold according to their value in terms of grade and shrink. Little factors such as these add up to big profits over a period of years.

Doubtless the top 10 producers of this survey used the right kind of purebred rams. No matter how good a grade ram may be as an individual, his pattern of heredity is such a mixture that his offspring will lack uniformity and the right body conformation. This means that some of his lambs will develop more slowly than others, and they will all lack the form and natural fleshing that is so important in a top lamb.

Back in 1924, Oklahoma A. and M. College conducted an experiment which showed that a purebred Shropshire ram would add $1.98 to the market return from each lamb sired as compared to a grade ram. This experiment was conducted at a time when lambs were selling for $15 per cwt. When this figure is adjusted to current prices, the spread is amazing. Scrub rams are suicide to the commercial producer since they sire lambs that require just about as much feed, and fully as much time, labor, and equipment, and sell for less on the market.

What kind of purebred ram does the commercial producer want? First of all he should be the kind that sires fast-growing lambs which mature early and thus make the most economical

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Lexington, Kentucky, January, 1951

use of their feed. The best type commercial ram will need some size and scale. However, the big-headed, coarse-boned, raw-backed rams which are all too common with some breeds are just as undesirable as the "pony" kind. Excessive amounts of bone and large heads are likely to cause trouble at lambing time, when such rams are mated to small western ewes. Size is important, but must be moderated by a certain amount of quality, natural fleshing, and thickness. Then, too, the commercial producer must insist on the open-faced kind. He cannot afford to raise "wool-blind" lambs.

That the purebred breeder can produce the kind of sheep the commercial producer wants and demands is amply illustrated by the history of the Rambouillet in the United States during the past half-century. In the early 1900's the Rambouillet was inclined to be small, excessively wrinkled, angular, and narrow on top. Despite the fact that it sheared a high-quality fleece, it was not a particularly desirable kind of sheep to the western rangeman or to the midwestern feeder interested in the production of feeder lambs.

Prodded on by the demands of ranchman and feeder, with the constant threat of competition by other breeds moving in on the western range, the purebred Rambouillet breeders got busy. They selected for the larger, smoother type and found, as they did so, that they were developing sheep which were not only more economically useful from the standpoint of conformation, ruggedness, and capacity to raise lambs, but that the yield of clean wool was actually increased on smoother ewes due to longer staple.

Today we have the modern version of the Rambouillet—relatively large, rugged, smooth, and the kind that when mated to mutton rams produces a crossbred lamb capable of topping the market. Nothing was sacrificed to produce this improved type of Rambouillet. No mysterious cross of minor breeds, no infusion of outside blood was needed to develop this economically useful sheep. The breed had within its own bloodlines, the necessary genes to produce the kind of sheep that both the ranchman and the midwest feeder wanted.

The years of rapid expansion that appear to lie ahead for the sheep industry will call for the best, coordinated effort of the purebred breeder, the commercial producer, and the extension specialist. Providing these problems are met and solved, we can expect a profitable era of sheep production.

Stretching Your Labor

Condensed from the Breeder's Gazette

D. Howard Doane
Doane Agricultural Service

WE all remember World War I, World War II and the more recent urge to "feed Europe." The current labor shortage looks so serious to many farmers that they are selling their farms. Older men who have experienced other war situations are not willing to go up against another period of long hours with little or no help. Whether we like it or not, it seems that we must once more face the facts and get ready for stretching our efforts to maintain production with less labor. Can we do it?

We responded with a resounding YES in 1940–45 under much more difficult conditions than those at present. *We can* and *we will do it again.*

Here's why and how:

(1) We have more and better equipment than before.

(2) We know how to use our equipment more effectively and are better prepared to keep it operating, because of more efficient farm shops.

(3) We have expanded our grass and small grain crops and cut down on row crops.

(4) Fewer acres are producing more gross yields as a result of better seed, more and better fertilizers and the use of chemicals in controlling weeds, insects and plant diseases.

(5) We have made a fair start in converting our farmstead buildings into tools that save labor, make work easier and lower costs.

These are not the only reasons why we can do a better job now than in 1940. But they do play an important part in helping us meet labor shortages and conform to pending Government controls.

During the past summer I have spent more time than usual on Grassland Farm. I have tried to inaugurate as many labor saving ideas as possible. Here are a few of them:

Grassland Farm now contains 1,000 acres. U. S. Highway 40 runs right through it. This calls for extra fencing and more gates because we have to move our stock longer distances for sorting, spraying, weighing and shipping.

Early this summer, I cleared out

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Louisville, Kentucky, February, 1951

a little brushy patch about 100 feet square and ran woven wire around it. I fastened most of the wire to small trees, added an interior sorting chute and a holding chute. It is located near a lane and two men can drive cattle into it quite easily. It is central to the main pasture area. We drive the cattle into this pen and spray them for flies. We had a few cattle go lame; so we placed a foot trough in the chute and filled it with bluestone solution, so, as the cattle leave the pen, they have to walk through the solution. This whole arrangement cost less than $25. It saves that much every time it is used, in terms of lost weight—if we had to drive the cattle to the more distant central headquarters.

Gradually I am *making my pastures smaller.* I now have 13 fields and two lots, and every one has spring water or a small stream in it. In two units, small springs are reinforced with ponds, one of which is a natural sink hole. Water is pumped to but one place on the farm (the barn) for livestock.

Whenever possible, I place two or more gates in series, so that I can move stock by simply opening or shutting gates. At one point I have four gates.

We have completed our scales, scale house, handling chutes, loading chutes and pens at the main barn. Here we can cut a bunch of cattle or hogs into 10 different lots or pens, by simply swinging gates. These arrangements have been time-saving this year in handling the cattle that are on the grass-gain test where many of them are weighed individually each month.

We buy most of our corn for feeding hogs. It comes in truck loads to a central crib. As needed we have been hauling wagon loads from the crib to the self-feeders. This calls for shoveling from crib to wagon, then from wagon to feeder. Our new system calls for an overhead bin filled from the truck by elevator. Our new experimental hog feeder built on a steel-wheeled wagon, will be filled from the elevated bin, hauled to the field, driven onto a feeding platform, spouts lowered, and the corn is fed with no shoveling.

Material is in the yard for our new lumber shed. We find it pays to keep building supplies on hand. In the past, they have been scattered at different places over the farm. Now all new purchases and all old lumber salvaged, if of any value, will go into assorted bins in the new shed. This, we feel, will lower our lumber costs because we can buy in larger quantities and by having it protected from the weather, prevent decay. It will save time in hunting for any odd pieces when small repair jobs are to be done.

Our shop is now completed, with electrical equipment for grinding sickles and tools and

making the usual repairs required on the farm. It is large enough so we can build our new creosoted gates in it during rainy weather and catch up on jobs held back for bad weather. We try to keep a generous supply of the often-used parts and repairs on hand.

All farm work is now done with two Ferguson tractors. This year our tractors have dug post holes and pulled posts, stretched fences, moved feeders and hog houses, dragged logs, graded roads, filled old ponds, mowed grass and brush, plowed, sowed, cultivated, raked, hauled, and transported men and materials.

After all present plans are completed, we expect two men will handle the 1,000 acres, 150 to 200 cattle, and 200 to 300 hogs, besides planting new pastures and mowing the old ones.

Maleic Hydrazide

Condensed from the American Fruit Grower

D. G. White, W. C. Kennard, L. D. Tukey
The Pennsylvania State College

All horticulturists are watching developments with the use of a new compound which literally anesthetizes plants for temporary periods. Fruit growers, vegetable men, florists, and landscape gardeners all have a fair-sized stake in the future of this new compound.

The compound is called maleic hydrazide (muh-lee-ick high-drazide) rather than by its more detailed name of 1,2-dihydropyridazine-3,6-dione, and some people have proposed that it be designated just by the initials MH.

The unique effects of maleic hydrazide were noted first in 1949 by Drs. D. L. Schoene and O. T. Hoffman of the Naugatuck Chemical Division of the United States Rubber Company in Naugatuck, Conn. These two scientists discovered that tomato plants and some grasses ceased to grow temporarily if they had been sprayed with quite low concentrations of maleic hydrazide.

The important part of this observation was not that they ceased growth, but that this cessation of growth was only temporary and the plants then resumed growth. One use of the compound suggested in this first report was its application to lawn grasses, with

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the resultant possibility of fewer necessary mowings.

In the spring of 1949, Naugatuck Chemical mailed samples of maleic hydrazide to plant scientists in all parts of the United States. And now, a little over a year later, reports from several investigators indicate that the economic value of this or some similar compound may be enormous. Maleic hydrazide may become a common material useful in a myriad of ways by practically every person who grows plants. There is much which must be learned, however, before you are likely to use this compound that inhibits growth temporarily.

At the Pennsylvania State College our main interest in maleic hydrazide was its possibilities as a material which might delay the blossoming of fruits 10 days to two weeks in the spring. Quite often such a reasonable delay in blossoming would avoid the serious damage of cold weather which occurs so many times during the period of full bloom.

Our goal is to develop a practical method for fruit growers to treat their plants so as to delay blossoming in the spring a reasonable period without subsequent injury. We have been partially successful in attaining this goal with some fruits, and we are encouraged toward the others.

The most satisfactory test plants so far have been brambles, such as black and red raspberries. The treatment has been simply to spray dilute water solutions of maleic hydrazide on these plants in the spring when the leaves were expanded to about the size of your fingernail.

We do not know yet what concentrations to recommend because the treatments must be repeated a few years in order to establish a record of consistent behavior. A low concentration of 50 p.p.m. (0.005 per cent) resulted in a delay in blossoming of about one week, whereas a concentration of 2000 p.p.m. (0.2 per cent) delayed blossoming as much as a month.

Concentrations in between these two extremes have delayed blossoming in the same order of magnitude as the concentration; that is, the greater the concentration, the greater the delay in blossoming.

Certain details must be settled, however, before bramble growers can use maleic hydrazide safely. For example, the highest concentrations may cause damage to the foliage and sometimes result in misshapen fruit. In our work over two years, however, undesirable effects of the first year's treatments were not evident the second year. Although injuries have not occurred with the use of low concentrations, nevertheless the threshold concentration which divides injury from no injury must be

determined.

Another detail concerns the use of wetting agents which apparently increase the effectiveness and possible injury from maleic hydrazide. On the other hand, when a wetting agent is included in the solution, much lower and therefore less expensive concentrations can be employed with desirable results.

For the present, we can predict that 50 to 500 p.p.m. of maleic hydrazide plus a wetting agent will delay blossoming of raspberries for one to two weeks without apparent injury to the plants or to the fruit. There is a slight possibility that the fruit of treated plants may contain amounts of the chemical which might be toxic for humans, but we have not noticed any effects after eating treated fruits.

Some of you are going to question the importance of delaying blossoming in raspberries because they usually bloom so late naturally that frost rarely harms them. A point of more interest to bramble growers is that the berries which develop from delayed blossoms mature later than those not treated. The main value of maleic hydrazide with brambles, therefore, is more likely to be the delay in maturation of the fruit and consequent lengthening of the harvest season.

We have found that the delay in maturation of raspberries from treated plants is not always equivalent to the delay in blossoming. For example, blossoming may be delayed two weeks while maturation of the fruit from the same flowers may be delayed only about 10 days. These differences probably occur because of environmental changes, primarily in temperatures.

An extreme example of delaying fruit blossoming and maturation was experienced this summer with Latham raspberries. Sprays of 2000 p.p.m. of maleic hydrazide delayed the first fruit maturation 56 days. The last of the Latham berries, fully developed and of good flavor, matured the latter half of October. Among seven varieties of red raspberries, there were some differences in the amount of delay in blossoming with the same concentration, but in all cases flowering and fruiting were delayed without injury.

We will not say much about the effects of maleic hydrazide on many other fruits just now; experimentally, however, we have had response to sprays of maleic hydrazide on plants of apple, peach, sour cherry, sweet cherry, plum, currant, gooseberry, grape, and strawberry. Although a foolproof method for obtaining the desired effects is yet to be developed, we believe the future is rather bright.

Sometime before many years we predict that fruits, grown where

cold weather often damages flowers in the spring, will be treated with some material like maleic hydrazide to delay their blossoming a reasonable period of time. In addition, small fruit growers may be apt to use it to spread out the harvest season for their own convenience and to avoid glutted markets.

Many additional uses of maleic hydrazide have been advanced. Dr. J. E. Knott of the University of California found that the production of undesirable new shoots on a *Pyracantha* hedge could be prevented effectively by spraying with this compound. Such treatment eliminated the necessity of clipping the hedge so often in order to maintain a uniform appearance.

R. R. Miller and D. Erskine of Ohio State University used maleic hydrazide sprays on ginkgo trees to prevent the set of their obnoxious fruits.

Dr. A. W. Naylor of Yale University discovered that corn plants treated with the material did not produce pollen but that the ears developed without injury. This observation may be adopted by breeders of hybrid corn to eliminate the considerable manual labor required to cut the tassels off stalks which are to be pollinated from some other stalk. He also found that maleic hydrazide inhibited the development of flowers on tobacco plants and has suggested that it might be used for the same purpose on such plants as lettuce and celery, where development of seed stalks is usually undesirable.

At the Arnold Arboretum, Dr. R. H. Fillmore lengthened the decorative period of cut roses by treating dormant shoots with maleic hydrazide—an application which may work with some other flowers. Dr. S. H. Wittwer and R. C. Sharma at Michigan State College prevented root growth and sprouting of onions in storage by pre-harvest sprays with this chemical. Sprout growth of stored carrots similarly was inhibited, and it is possible that such treatments may be effective in preventing development of undesirable sprouts on stored irish potatoes.

As a selective weed-killer, maleic hydrazide also seems promising when it is used at concentrations higher than we have mentioned. Young Johnson grass and various water grasses growing in cotton were killed but the cotton was not injured, according to Drs. H. B. Currier and A. S. Crafts of the University of California.

And an obnoxious pasture weed, wild onion, was controlled without permanent damage to the grasses by Drs. V. C. Harris and O. A. Leonard in Mississippi. Young crab grass was killed by concentrations which did not injure desirable grasses, according to Dr. J. W. Zukel of the Nauga-

tuck Chemical Division.

Horticulturally, this material has potential applications useful to the grower, the processor, the dealer, and the housewife.

More Pork from Less Feed

Condensed from the Hog Breeder

R. C. Miller and J. L. Gobble
Pennsylvania State College

In addition to strictly commercial hog enterprises, hogs are grown and fattened to furnish farm household meat supplies and to utilize miscellaneous feeds including garbage, which might otherwise be wasted. Hogs furnish a profitable outlet for any home-grown grains not otherwise used in dairy and poultry feeding.

Grains and protein supplements which must be purchased for hog feeding have been relatively high priced, so that economical methods of feeding are important if pork production is to be profitable. During recent years experimental work has revealed several practices contributing to economical pork production which may be found to be useful on many farms.

It is highly desirable to have a suitable ration for creep feeding and for feeding to young pigs immediately after weaning. This is especially true if pigs have been farrowed at a season when it is impossible for them to be placed on pasture at an early age.

Commercial pig starting feeds are generally available and two experiments have been conducted comparing a commercial pig starter with a home mixed starting ration and also with a commercial chick starter.

The home mixed starter was made up of ground shelled corn 4 parts, ground oats 3 parts, wheat standard middlings 2 parts, ground alfalfa 1 part, 34 per cent protein tankage 1.5 parts, ground limestone 0.2 parts and salt 0.1 part and contained 15 per cent of crude protein. The commercial pig starter and chick starter contained 20 per cent of protein.

The pigs used weighed approxi-

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Chicago, Illinois, September, 1949

mately 25 pounds and were hand fed all of the feed they would consume twice a day. They were carried on feed to a weight of approximately 70 pounds.

Satisfactory gains were made by all of the pigs, all of the feeds being readily eaten. The most economical gains were made, however, on the higher protein levels with the commercial mixed feeds. On both of these feeds there was a tendency for the pigs to scour which however did not appear to be detrimental or influence their gains adversely. It was apparent, however, that the best pigs were produced with the chick starter and it is felt that this type of feed can be recommended if it is necessary to purchase a starting feed. With the chick starter 331 pounds of feed were required to produce 100 pounds of gain, with the pig starter 380 pounds, and with the home mixed feed 544 pounds.

Without question it is of advantage to have a level of protein in excess of 15 per cent in starting rations for pigs. In addition, the higher levels of some of the vitamins and other nutrients and the lower level of crude fiber usually found in chick starters may often make this type of feed quite suitable for young pigs.

The question is often raised as to whether or not it is necessary to shell corn before grinding and whether it is economical to feed ground corn-and-cob meal to hogs. A feeding trial with growing fattening pigs showed that this feed is probably too bulky for this type of pig. The cost of feed was much the same when pigs were fed free-choice on corn-and-cob meal as compared to ground shelled corn with both lots receiving minerals and a protein supplement. However, the average daily gains were 1.16 pounds on the corn-and-cob meal as compared to 1.47 pounds on ground shelled corn.

The bulky feed restricted the amount consumed by the pigs, so that with corn-and-cob meal an additional period of time would be required to bring them up to the weight of pigs finished on the ground shelled corn. Aside from the element of slower gains, the corn-and-cob meal was approximately equal to ground shelled corn.

Bulky feed is desirable for brood sows and it was found that corn-and-cob meal was satisfactory for feeding mature sows during gestation and when suckling pigs. Two feeds were compared, one made up of corn-and-cob meal 80 parts and protein supplement 20 parts, and the other of ground shelled corn 68 parts, alfalfa meal 20 parts, and protein supplement 12 parts. The protein supplement was comprised of equal parts of 34 per cent protein tankage and soybean oilmeal, and a mineral mixture consisting of 2

parts of ground limestone and 1 part of salt was fed free-choice. Both feeds provided about 14 per cent of protein and were similar in fiber content.

The results obtained with the two rations were very similar judging by the maintenance of live weight by sows, the number of pigs farrowed per litter, the number of pigs weaned per litter, and the average weights of the pigs at farrowing and at weaning times.

Since a bulky feed is desirable for brood sows especially during the gestation period, this bulk may be economically obtained by using corn-and-cob meal, thus saving any expense involved in shelling corn previous to grinding.

The value of pasture for hogs cannot be overestimated. Its value has been demonstrated repeatedly but in order to get the greatest and most profitable utilization of pasture the whole general feeding program must be considered.

Pigs fed on pasture alone are able to satisfy only part of their needs for energy, protein, vitamins and minerals. For growing pigs more economical gains can be obtained with pasture if full attention is given particularly to the type of protein supplement fed as an adjunct to the pasture. The type of pasture employed may determine in part the kind of protein that should be fed.

Experimental work on the college farms has indicated that ladino clover pasture is particularly good for growing-fattening pigs, and that they are able to obtain from ladino clover, one-third or more of the protein they require.

In the first trials on ladino clover, a protein supplement of equal parts of 34 per cent protein tankage and soybean oilmeal was fed together with ground shelled corn in proportions to furnish 10, 20 and 30 per cent of the total ration other than the pasture.

The gains were identical for the pigs fed the rations containing 10 and 20 per cent of the protein supplement, but after 42 days of feeding, the pigs fed the 30 per cent supplement ration began to grow more slowly and to lose appetite, owing probably to an excessive amount of protein.

In a further experiment the 10 per cent supplement mixture was self-fed with 90 per cent of ground corn in the mixture. After 28 days 20 pigs were removed from the pasture and fed in dry lot with no green feed, 20 pigs were fed freshly cut ladino clover in dry lot, and 20 pigs were continued on the pasture, all lots being fed the ground corn supplement mixture.

Over a 70 day period the pasture group made an average daily gain of 1.33 pounds, the dry-lot group 1.24 pounds and the soilage group 1.44 pounds. The group fed the fresh cut ladino clover made the fastest but the most

expensive gains.

In a later experiment ladino clover pasture was compared with orchard grass and dry-lot feeding. Shelled corn and protein (equal parts of soybean oilmeal and 34 per cent protein tankage) were self-fed separately.

This experiment ran over a period of 108 days, the pigs finishing at an average weight of 176 pounds. The respective average daily gains per pig were 1.17 pounds on ladino clover, 1.05 pounds on orchard grass and 1.00 pounds in dry-lot. The total feed requirements per 100 pounds gain were 346 pounds on ladino clover, 375 pounds on orchard grass and 400 pounds in dry-lot. The value of the ladino clover can be seen from the total amounts of supplemental protein consumed by these pigs which were only 12.9 pounds on ladino clover as compared to 22.2 pounds on orchard grass and 45.3 pounds in dry lot. It is obvious from these figures that a considerable saving, particularly of protein, was made by the pigs in the ladino clover.

It is not felt that unqualified recommendation can be given to the protein supplement used in these experiments. Because low protein tankage, usually produced locally, is generally available to Pennsylvania farmers, a large number of the experiments have been conducted to determine its value. The findings may be summarized in general by saying that this type of tankage may probably be best utilized when employed in a mixed hog feed in amounts not exceeding 10 per cent. The results obtained when it comprises half of the protein supplement have not been completely satisfactory in all respects. It should not be used as the only source of supplementary protein.

This is borne out in results obtained in dry lot and in pasture experiments employing orchard grass alone and mixed red clover and orchard grass pasture. The pigs were self-fed shelled corn, protein supplement and minerals consisting of two parts of ground limestone and one part of salt.

One half of the pigs received only soybean oilmeal as the protein supplement, the other half a mixture of equal parts of low protein tankage and soybean oilmeal.

Total feed requirements per 100 pounds of gain were 350 pounds on soybean oilmeal and orchard grass, 352 pounds on soybean oilmeal and mixed pasture, 399 pounds on mixed protein and orchard grass and 386 pounds on mixed protein and mixed pasture.

The efficiency of soybean oilmeal as a protein supplement is further shown in average daily gains of 1.24 pounds on both the orchard grass and the mixed pasture, as compared to 1.10 pounds on mixed protein and orchard

grass and .99 pound mixed protein and mixed pasture.

It may be rather surprising that a single source of protein such as soybean oilmeal can serve as the entire protein supplement and produce good results. However soybean oilmeal is very palatable for pigs and is eaten readily, while a number of tests have indicated that low protein tankage is fairly unpalatable—even a mixture of this tankage and soybean oilmeal not being consumed as readily as soybean oilmeal alone.

The use of forages and pasture for swine should be extended whenever possible. When maintained in a thrifty condition they may be depended on to carry the overhead of a feeding program over the entire growing season.

Reinforced Manure Doubles in Value

Condensed from the Wisconsin Agriculturist & Farmer

Did you ever stop to figure what that manure is worth as you haul it out? An average ton will contain about 10 pounds of nitrogen, five pounds of phosphate and 10 pounds of potash.

That's a lot of fertilizer. It's there when you start out—but it may never find its way into the soil.

When the manure is spread, the nitrogen begins to escape into the air in the form of ammonia. The longer your manure lies there and the drier it gets, the more nitrogen you lose.

Problem is, how can you hold that nitrogen where it belongs—in the manure?

"Adding superphosphate to your manure, or spreading it liberally in the gutter, is the best answer," advises C. J. Chapman, soils specialist.

When you add superphosphate, a chemical reaction takes place between it and the ammonia. And so, when fermented manure which has had a shot of superphosphate is hauled to the field, the ammonia loss is reduced.

Adding 25 pounds of 20 per cent superphosphate to a ton of manure will raise the phosphate content of that manure from five to ten pounds.

In fact, it's been estimated that

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one load of reinforced manure is more valuable than two loads of untreated manure.

How much do you use and what's the best way to apply it?

"It's a common practice to spread superphosphate in the gutters at the rate of one pound per day per cow," says Chapman.

Some farmers mix it in the manure as they load the manure spreader. That works all right. Biggest argument for putting it in the gutter is the fact that it will absorb most of the liquid manure and cut down barn odors better. And you'll get a better job of mixing, too.

If you're using a loose housing set-up, or have cattle in sheds or box stalls, it's a good idea to spread superphosphate in there, too.

You won't need to use it quite so often, though. Once every four or five days should do the job. And you should put some bedding in there as soon as you spread it to prevent possible foot irritation.

What about adding potash to your manure? Some farmers do it and get good results. If your soil needs potash, results from applying superphosphate alone won't be too good, because the two work together.

The best bet is to have your soil tested before you apply any fertilizer. Then you know what it needs.

Is there any point in adding lime to your manure before you haul it out? You probably won't gain too much by adding ordinary ground limestone.

If your soil needs lime, it's pretty hard to add enough to your manure to do any good. And as far as fresh manure is concerned, it won't do much to prevent ammonia loss.

Experiments have shown that, when applied to fermented manure, agricultural lime does tend to prevent loss of ammonia.

The thing to keep in mind is that most soils need phosphate. By adding some to your manure you're adding it to your soil.

A Look at Tomorrow's Insecticides

Condensed from the New Jersey Farm and Garden

Dr. T. Walter Reed

FACED with a bewildering number of new jawbreaking names for bug killers, many a farmer is asking himself, "Where is it going to end?" Prof. A. J. Farley, of Rutgers estimated last year that 85% of the cost of producing fruit was tied up in sprays and dusts—and the labor and equipment required to apply them.

Some farmers wonder if the new synthetic insecticides are a Frankenstein come out of the test tube, and whether or not they are creating more problems than they solve.

In these days of specialization, we will have to assume that farmers must continually strive for better quality if they are going to stay in business. We know that insects have plagued mankind since the beginning of time and we know they can adjust themselves to changing conditions.

Some of our older materials have outlived their usefulness, others will remain. The battle against insects will be growing more selective all the time. The only real comfort the grower can take is that his neighbor faces the same battle, so that they start off with equal competitive advantages in this respect.

Assuming, then, that we are going to use insecticides, which ones shall we use? Let us look at some of the questions being asked about them.

(1) Do they destroy certain beneficial insects and create new economic problems?

Any insecticide kills both good and bad insects. In some cases this has resulted in the killing of parasites of heretofore unnoticed pests which in turn have become more costly nuisances than the original pest. However, these new pests usually have been easily controlled by a timely application of the proper insecticide; in many cases they could have been avoided by a two-purpose material in the first place. Oftentimes the newcomers are not as bad as they might seem. Are we not just a little disappointed that the new insecticide did not control all the bugs, leaving us pest-free, rather than faced with a new adversary?

We might as well face this fact: if it is not one bug after our crop, it will be another. When DDT was used in the apple orchards, it

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Sea Isle City, N. J., June, 1950

reduced the codling moth from a giant to a docile annoyance. True, mites became a problem, but I have not yet encountered any apple growers being forced to chop down their apple orchards because they cannot control mites.

Another thought to consider: There are no new pests. They have been here all the time, just waiting for an opportunity.

(2) In case of food and feed crops, do these chemicals remain in sufficient quantities to be injurious to man and animals?

When the wrong chemical is chosen for the job, or applied at the wrong time, this can and will be true. Fortunately, the discovery of a large number of very different new chemicals gives us the opportunity of selecting one with the proper characteristics and using it at the proper time. Thus, in most cases the pests can be controlled with no dangerous residues remaining on the food or feed crops.

In other words, it is our own fault when we contaminate food and feed with insecticides. For example, we can kill aphids on fresh vegetables with DDT or other long-lasting chemicals, but we would be foolish to use them under these circumstances when we have available such materials as TEPP, which leave no poisonous residue and which—in most cases—will do the job quicker and better.

(3) Does this mean "good-bye" to such residual products as DDT, parathion, chlordane, and toxaphene?

Definitely not. However, it is quite evident that it would be unwise to use this type of insecticide on fruit or vegetables about to be harvested. It would be equally foolish to depend upon fast-acting, short-lived materials such as TEPP, rotenone, or pyrethrum to protect the growing plants when there is no edible portion present.

Our problem is not to throw away these useful remedies, but to learn to use each at the proper time for the right bug.

(4) Are more and more varieties of insects going to acquire resistance to these new insecticides, causing us to spend more and more for sprays and dusts?

The ability of insects to adjust themselves to changing conditions and food supplies is one of their basic characteristics. There is reason to believe that they will adjust themselves to any insecticide, given time enough. However, I question whether "resistance" is the right word to use for this. It it probably much more likely to be a case of selection. This brings to mind an experience that occurred a short time ago.

I was talking with an airplane crop dusting pilot who had just finished doing a difficult dusting job and I complimented him on his skill, saying, "You duster pilots certainly are good at handling

your airplanes." He replied, "Sure, all the poor ones are dead."

When one speaks of a species of an insect acquiring resistance to an insecticide, is it not quite likely a case of all the poor ones being dead? True, there are certain characteristics of some insecticides that probably will result in the breeding of resistant strains faster than others.

Long-time contact probably helps to create resistant strains of insects, particularly those which breed very rapidly (like flies) and are killed by walking over sprayed or dusted surfaces.

The larger the number of insecticides we have to choose from, the less widely any one will be used. We will have a chance, too, to alternate their use. This also gives the insect population country-wide an opportunity to escape contact with any one insecticide. This, we believe, will at least slow down the development of resistance and keep our present day insecticides useful for a much longer period of time. Therefore, our solution to this problem appears to be to develop a larger number of insecticides rather than limit ourselves to a few.

(5) Will we return to the use of stomach poisons such as the arsenicals and fluorine compounds, and to such contact poisons as nicotine, rotenone and pyrethrum?

Yes and no. Where the newer synthetic organics will do the job better, cheaper and safer, they will be used. In fact, the competition of growers who do use them will force others to do likewise.

For example, we will continue to use, probably for some time, rotenone and pyrethrum for bean beetles attacking snap beans. But undoubtedly we will continue to use the old standby, arsenate of lead, for the protection of non-edible foliage against chewing insects where it is desirable that one spray give protection for a long time. We will use such highly specific materials as toxaphene for the control of cutworms. We will use lindane where a short time residual contact, fumigant, or stomach poison is desired, and where it is desired to control aphis, thrips, spittle bugs and other sucking insects at the same time.

For example, why use calcium arsenate to poison cucumber beetles on young cucumber or canteloupe plants, when each day the plant provides a new poison-free leaf for the insects to feed upon—when, at the same time, aphis and thrips may be building up in damaging numbers? A material such as lindane will not only kill all of these bugs present at the time of application, but protect the plants until considerable new growth and a reinfestation occurs.

(6) Are contact poisons such as TEPP too short-lived to do as

good a job as stomach poisons? Where will insecticides like parathion with a life of several days to two weeks fit in?

Answers to these questions depend upon the job that is to be done. Where the insect population on the plants "stays put," when we know if these are killed there will be no more around that season or for a long time, then short-lived contact materials are preferable. They do not disturb the natural enemies for a long time and there is less likelihood that some secondary or unexpected pest may be encouraged.

Many entomologists are coming to the conclusion that short-lived contact insecticides are to be preferred to long-lived residual contact insecticides. They feel that an insecticide should last just long enough to do the job desired. On the other hand, where the crop is attacked by a continual migration of insects, then a long-time residual poison appears to be in order. Otherwise, we will be required to spray or dust every day or so.

If we can deposit a spray residue that will kill all bugs as they fly into the field and provide protection for several days, then the longer residual poisons such as parathion, DDT, etc., will be called for. In fact, during the growing of any one crop the wise grower probably will use as many as three or four different materials, each to do its own job.

(7) Is the day approaching when we can get cheap, all-purpose insecticides?

The prospects of this utopian condition appear to be very dim. What is more likely is that we will tend toward the use of a different insecticide for each job. Our problem then, as now, will be to select the right material for the right job and use it at the right time.

As regards the development of cheap insecticides, it is well to keep in mind that the initial cost of the insecticide chemical may not be the important factor. More important will be the question of how efficiently it does its job, and how much profit will be left for the farmer at harvest time.

Quite often the most expensive chemicals turn out to be the cheapest when the results are figured in dollars of profit.

The problem of learning enough about all the new spray materials as they are developed is going to be a large one, both for the insecticide industry and for our state and federal scientists. Unquestionably this challenge will be accepted and the necessary knowledge will be gained. Then it will be up to the grower to pit his ability to use this knowledge against that of his competitors.

New Attacks on Plow Sole and Hardpan

Condensed from American Agriculturist

Jim Hall

For three years in the 1930's, Bill Graham of Silverton, Texas, had tried everything to keep his land from blowing away in the dust storms. He was about desperate in 1937 when the combine man arrived to harvest a sickly crop of wheat. But the combine man had some news—Fred Hoeme, up in Hooker, Oklahoma had saved most of his soil and produced fair crops, despite the dust storms, by using a home-made field cultivator.

Bill hurried to Hoeme's and at first was disappointed because all Hoeme had was a two-wheel rig with two-inch chisel-tipped shanks welded to three beams of railroad iron. However, looking at the slight amount of wind erosion on Hoeme's place, he wanted the story:

Two years before an Oklahoma highway worker had dragged a scarifier across Hoeme's field. The machine, built with long spikes for tearing up old road surfaces, had dug rows of deep furrows across the field. The next year Fred noticed that where the furrows had been dug, the wheat was a foot higher and healthier than in other places. Fred built one row of the shanks three feet apart on a railroad iron and used the rig to dig furrows in his wheat before the spring winds. Later he built the three-beam machine with shanks staggered to furrow every 12 inches and used it to follow his normal plowing.

Bill had long been convinced that constant plowing powdered the soil to such an extent that it was ripe for erosion so he took one of Hoeme's machines home and, despite neighbors' snickers, put his own ideas to work. He used the rig to plow deep instead of as a cultivator. His field didn't lie smooth and clean. In fact it looked trashy with clods, straw and vegetation and was a maze of little 6-inch furrows, 12 inches apart.

Bill dug a hole in the field and found that the chisels had cut through the subsoil and had run cracks through it in all directions. His second discovery was that the powdered dirt sifted down between clods and trash so that the wind didn't pick it up.

A week later a 5-inch rain disappeared into this rough looking

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Ithaca, New York, February 3, 1951

land even though on nearby fields it caked and sealed over the powdered soil, causing heavy erosion. After two years' use of Hoeme's machine, USDA experts checked and found moisture penetration to 52 inches in Bill's field as compared to 24 inches on adjoining land. The next year Bill harvested four times as much wheat as from any other field in the neighborhood!

Fred Hoeme sold his patents to Bill Graham who started manufacturing the new plow in 1939. Today his factories have a capacity of 500 a day.

Weeds flourished behind the Graham plow until Bill devised two self-sharpening blades to attach in a horizontal position on the shanks. Now the earth is chiseled and the weeds cut in one operation.

Bill's plow, which looks more like a long tined spring-tooth harrow, was introduced to Northeast farmers not many months ago. Here, few are interested in the big 45-foot but the 5 to 10 foot models are being highly boosted by their owners. They are finding that by taking three bouts around the field and then angling back and forth at right angles to the natural run-off direction, the 6-inch terraces prevent washing. Some are using moldboard plows followed by the Graham to stir the plow sole and subsoil and create the soil-saving terraces, and others who want smoother seed beds are dragging a smoothing harrow or plank float behind the Graham.

The importance of breaking through the plow sole and loosening the subsoil to rid fields of wet spots and to provide a larger reservoir of moisture for dry times has been recognized by many large manufacturers who have met the need with special equipment. The Oliver TNT plow which turns a little furrow in the subsoil right under the main plow, has increased yields for all crops in every kind of soil except sand. The TNT can be set to plow 10 inches with the top base and four inches with the lower, for a total 14-inch penetration without bringing subsoil to the top.

Several companies make subsoilers and of course the rotary tillers, such as the Seaman, are designed to give uniform tillage to full depth with no plow sole to seal off sub-surface moisture.

Whatever equipment they are using, farmers who are breaking up the plow sole and hard pan are convinced that the deep penetration pays off.

The Kind for Most Profit

Condensed from The Shorthorn World

Paul Gerlaugh
Ohio State Experiment Station

THE folks at the dinner table don't care whether the beef came from a steer that was halter-broken or not. Tenderness, flavor, and cost are the big items to them. Many families need to put cost in first rather than third place. They, too, like meat and have learned that a dollar's worth of hamburger goes a lot further than a dollar's worth of porterhouse steak.

Beef cattle can and do adapt themselves to a wide range of feed supplies. In some places it is almost all grass and hay. We find breeding herds in those locations selling feeder calves or yearlings to Corn-belt feeders who use grain extensively in their rations. There are all sorts of combinations of roughage and grain that are used successively.

There is no one best pattern to follow. The most successful men fit their cattle program to their feed supplies, rather than the reverse.

Here at the Ohio Experiment Station we have never raised and sold feeder calves. We have seen it done with only grass and hay. We have maintained a breeding herd and fattened the calves following weaning, or sometimes have grazed the calves a season before fattening, to choice baby beeves on corn, hay and supplement. This system of beef production which included corn silage for wintering the cow herd used a ratio of 2½ acres of good pasture and hay land to one acre of good corn.

Buying steer calves in the fall, wintering, grazing the following summer, and fattening in dry lot the second winter uses about the same ratio of pasture, hay and corn acreages as keeping the cow herd and fattening the calves.

Fattening steer calves to a choice finish will frequently use five, six, or more acres of corn to one acre of hay. Yearling steers fattened on corn silage, hay and supplement have eaten in our feed lots as high as eight acres of corn to one acre of hay. This latter system is efficient use of the corn crop but it makes for a lopsided farm rotation with its resulting problems. Early-maturing cattle fattened at light weight fit the farmer with a big corn crib

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Aurora, Illinois, August 10, 1950

rather than the farmer with the big pasture field or the big hay mow.

In one of our tests which involved eight crops of calves we found that steer calves of one breed out-dressed steers of another breed by .7 per cent, the averages being 60.3 per cent and 59.6 per cent, and yielded carcasses that graded 76 per cent choice as compared to 59 per cent choice for the other group. However, the steers that did not dress as high saved a big hundred pounds of corn-and-cob meal in making each hundred pounds of gain in the feed lot. The saving in production costs was noticeably greater than the premium we were able to get for the higher dressing percentage.

The higher dressing steers were, in my estimation, earlier maturing than the more efficient feed users that didn't dress quite so high. That is another way of saying that a thousand-pound steer sired by a ton bull is further from maturity than a thousand-pound steer from a 1500-pound bull. It is fundamental to say that in livestock production the nearer an animal reaches maturity the more feed it takes to make gain. Ton bulls are not too big to suit a lot of commercially minded beef cattle folks.

Several years ago we used an 1800-pound bull for 2 years, then followed with a 2100-pound bull for a two-year period. The same cows raised calves sired by the larger bull that were 70 pounds heavier per calf at 16 months than the calves from the lighter-weight bull. In another cow herd the same four years we followed a 2100-pound bull with an 1850-pound bull. This lighter-weight sired calves about 50 pounds lighter in weight at 16 months of age from the same cows in comparison with the heavier bull. These experiences coming the same four years ruled out feed differences. It made one wonder if size of breeding animal isn't a more important factor than it is sometimes given credit with being. Size alone isn't the only characteristic to look for in a bull; however, size with conformation and fleshing do make for efficiency and value.

Around an experiment station a variation in tests is possible. Let me tell you about a test using different grades of steers; choice, medium, and common feeders of similar weights fed the same ration and sold in the spring of the year when plain slaughter steers invariably sell high in comparison with choice ones. Some say too high, but they sell that way. To make a long story short, the common feeder steers returned nearly twice as much for a bushel of corn as the choice feeders. Some of these common steers were black and white evidently of dairy-cat-

tle breeding. They gained with the best of the steers possessing beef breed characteristics. Probably their sires weighed more than a ton.

Last fall choice yearling feeders of pronounced beef type and charactetrisics cost $156 a head, while common feeders of similar weight cost us $112 a head on the same market the same day. Quality paid the producer of the choice feeders an increase of $44 a head. The feeder may not have made as serious a mistake. They have not been sold as yet. Quality invariably pays the producer, not necessarily the feeder. That situation makes complications in lots of people's thinking.

When one thinks of producing beef cattle, the udder on the breeding cow should not be overlooked. Here again one has to be reasonable. Some places too much milk will ruin an udder—maybe the calf, too. It does seem that the more pronounced beef type is oftentimes associated with poor milking qualities. That isn't good either.

What kind of bulls are needed to sire the profitable kind of commercial cattle? They should have a reasonable amount of size is certainly a safe way to put it. There are more bulls that are too small rather than too big in many herds.

Don't ignore the udders on these cows. That can be done without going into dairy type. There are men in Kentucky using "mountain" cows that have real good udders and a medium sized bull of pronounced beef type getting 600-pound calves at weaning time. The calves sell to the butchers in the fall at 7 to 9 months of age.

Isn't it correct to say that the better the herd of breeding cattle the bigger the problem to get a herd bull to make further improvement? What can be done about it? The men at the U. S. Department of Agriculture Range Livestock Experiment Station at Miles City, Montana, have a program that is well worth investigating. They are doing several constructive things. One thing which they are doing that is both relatively simple to do and constructive in results is the work in their bull testing program. Bull calves soon after weaning are put on feed for a period of about 200 days. The men find out by that program which calves are the fast and efficient gainers. They find, a big variation in the feeding ability of these bull calves. This system finds the best performers by the time the bulls are of serviceable age.

The men who know genetics say that the characteristics of rapidity and efficiency of gains are transmitted from sire to offspring in a surprisingly high degree. That sort of a program carried on for a few generations will

help solve the problems of a lot of breeders looking for a more efficient beef machine. Texas is already testing beef bulls. Other states, including Ohio, are considering the program.

The statement has been made that Robert Hazlett used nine bulls before finding one that put his herd ahead to the high pinnacle which it attained when he was eighty-some years of age. Many breeders have neither the time nor the money to repeat that experience. A bull testing program surely would bring out the efficient producers that the eye cannot find and avoid many of the hazards.

In the fall of 1949 we obtained three lots of steers from the U. S. Department of Agriculture Livestock Experiment Station for experimental feeding. We put two check lots in the test. One check lot were steers originating at Missoula, Montana, and the other check lot originated at Raton, New Mexico. We feed the five lots a pre-test ration for about five weeks before starting on the official test. Most folks have been kind enough to say that our check lots were good-doing cattle, not easy to beat. The test at this writing is not finished. The cattle are weighed each two weeks. At the end of six months on test there never has been a weigh day when the steers from the Range Experiment Station that were produced by the Science of Breeding have not been noticeably ahead of the check lots in rate and efficiency of gain.

The Miles City cattle finished 9.4 per cent ahead of the check lots, making average daily gains of 2.33, 2.34 and 2.38 pounds as compared with gains by check lots of 2.17 and 2.13 pounds. The Miles City cattle were 8.7 per cent more efficient in converting feed into gains in our test than the check lots.

A program that will do that job is well worth investigating, following, and perhaps improving. In our limited experience with the cattle in this test some of the breed characteristics of the Miles City cattle are not up to some standards. Color markings and short, broad heads are not as well defined as some insist on, but the steers look like they have put their gains where it counts. They have scale and substance. They are not "horsey" by Ohio feed-lot standards.

A more efficient beef machine will help materially in cutting costs so that the people who like beef, and there are many, will be able to better supply their wants at prices they can afford.

1000 Bushels of Apples per Acre

Condensed from Pennsylvania Farmer

Davis G. White

How would you like to harvest three or four times as many apples per acre as is customary? This has been done in the experimental orchards at the Pennsylvania State College and may be practical for commercial growers some day. Look over the yield data in the following table and note the unusually high yields from Rome Beauty trees grown on special root-stocks and planted 20 feet apart on the square:

Table 1. Yields of Rome Beauty on Malling II Rootstocks.

Age	Year	Bushels per acre
7 yrs.	1942	109
8 yrs.	1943	186
9 yrs.	1944	299
10 yrs.	1945	Frozen
11 yrs.	1946	634
12 yrs.	1947	605
13 yrs.	1948	696
14 yrs.	1949	1284

These trees were propagated, planted and cared for by Dr. R. D. Anthony, Professor Emeritus of Pomology, and Professor W. S. Clarke, Jr. In 1932 they made a nursery planting of these Rome Beauty trees grafted on special rootstocks named Malling II, after the English experiment station of East Malling where they were developed. In the spring of 1935 they planted 60 of these trees on 0.55 acre of soil of high fertility at half the usual distance apart. The reason they planted the trees 20 feet apart rather than 40 feet was because Malling II rootstocks are known to have a partially dwarfing effect on the tops. Such trees also come into bearing at an earlier age than trees on the usual seedling rootstocks.

The exceptionally high yields from this block are the result of the Malling II rootstocks and close planting. It is possible that Rome Beauty trees on seedling rootstocks would yield equally well if they were planted 20 feet apart but, based on experience, it is more probable that the Malling II rootstocks were an important factor.

Standard orchard machinery was used in this block until after the 1949 crop, but the branches were too close for convenience, so trees in every other row were pulled this spring. The remaining trees are now spaced 20 by 40 feet and are about 15 feet in height. A few of the Rome Beauty trunks had developed roots, but about 95 per cent of 30 trees removed were dependent totally on the Malling II roots. The few trees with Rome

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Pittsburgh, Pennsylvania, August 26, 1950

Beauty roots generally were larger than trees having only Malling II roots.

In addition to the high yields, this block of trees has had other advantages in comparison with ordinary apple trees. Because of their smaller size they have been less trouble to prune, spray, thin and harvest. Practically no limb breakage has occurred in spite of the heavy loads of fruit.

Unfortunately Malling II rootstocks are difficult to propagate and most nurserymen do not care to raise then. We are, therefore, attempting to find a source of seed which can be used as partially-dwarfing rootstocks and some day such yields may be common.

If You Want Early Tomatoes!

Condensed from the Kansas Farmer

W. G. Amstein
Kansas State College

EARLIER tomato production is an ambition of most gardeners. A pound of tomatoes for market the first week of the season is worth 5 to 10 times as much as during a glut period 2 months later. A practical answer has been worked out making use of hormones or growth-regulating substances to get early set of the blooms.

For years many different solutions to lack of early tomato production have been suggested. Some have worked while others have been a total flop. Weather usually has been blamed for failures and recent work has further emphasized this fact. Cool nights, such as commonly occur during the first bloom period of the tomato plant, seem to hurt our chances for early fruit. Pollination is not normal and the early or first-cluster fruits do not develop. If the night temperatures fall below 60 degrees Fahrenheit, poor fruit-set is to be expected. Then within 2 or 3 weeks, excessively high day temperatures may be expected and the pollen produced then is injured and a poor set develops.

Use of certain hormones to pro-

Reprinted by permission from the Kansas Farmer
Topeka, Kansas, May 6, 1950

vide for setting of early fruits, under conditions where untreated plants dropped their flowers, often gives results almost beyond belief. Tests in several states with common tomato varieties have generally demonstrated the practical benefit of fruit-set hormones. Not only are tomatoes ready to be picked a week or 2 weeks earlier from plants where the flowers were sprayed, but the fruits often are several ounces heavier.

Not only is earlier and heavier production obtained as well as larger fruits, but the same effect is noticed for several pickings in many tests.

If temperature and moisture conditions are favorable for a normal bloom and fruit-set, spraying hormones on the flowers will not show any benefit. This often is true with late plantings of tomatoes. Hormone spray often makes poorly-adapted varieties produce when otherwise the blooms would be shed.

I doubt whether you should try this hormone-spray treatment on all of your tomato plants for several reasons. First, you may not have time to treat all of them. Second, hormones may cause some twisted and distorted leaves for a time after the spray is applied. Third, total yield often is reduced even tho earlier yields are obtained on the sprayed plants. Fourth, plants producing a heavy yield early are often stunted so later clusters are not as fully developed as on an untreated plant.

You will notice very few seeds in fruits produced early with hormone sprays. If you keep the treated fruit around, it may soften more rapidly after being picked than untreated fruit. At times you may think it helps to develop blossom-end rot. This is rather doubtful. It is more probable that conditions where dry weather checked the plants resulted in more blossom-end rot showing up.

Several different types of hormone materials have been tested for this purpose. Actual chemical names are almost beyond pronouncing or spelling. We should be thankful for trade names under which commercial products are distributed. For example a spray solution made up of 30 parts of hormone (parachlorophenoxyacetic acid) per million parts of water has given good results. However, I suggest you look for one of the commercial products such as Sure-Set. Tomato-Tone, or No-Seed and use it carefully according to directions on the package.

If you want to apply these hormone materials arrange to have them on hand and plan to get a response in early fruit on set plants. Do not expect any market returns from spraying under normal conditions.

Apply spray first when 3 or 4 flowers are open on the first cluster. All plants will not be bloom-

ing at the same time. You will not care or need to take time to spray single plants, but will want to wait until several plants have 3 to 4 open flowers. Do not spray unopened flowers.

Second spray should be applied a week later when more flowers are open, if weather at night remains cool with temperatures below 60 degrees Fahrenheit. On determinate varieties such as Victor and Sioux you may not find it practical to apply a second spray since the individual flower clusters are close to one another.

In spraying do not cover the whole plant. Confine spray to the open flowers.

Hold sprayer nozzle fairly close to the cluster and avoid spraying leaves. Use care or foliage will develop a "new look." You do not have to spray solution into open flowers. Applying it to side or back of flower works as well.

Small atomizers, fly sprayers, and similar equipment can be used. It is better to have a sprayer or atomizer that has not been or will not be used for other purposes. A cone-shaped, fine-mist nozzle type of opening works best. Do not treat all your plants.

Some ask about spraying beans and certain other crops. Results thus far have not been as consistently good as with tomatoes.

Whatever you use or do, follow dilution directions on the package.

Well-Fed Calves Mature Earlier

You can hurry your calves along to maturity by good feeding. That's the word from Cornell University, where they are trying average, below-average, and above-average rations for young heifers and bulls.

The heifers on below-average rations need 4 months longer to reach the same udder development as the heifers getting more feed.

The heifers on above-average rations come in heat at 36 weeks; those on average rations, at 44 weeks; and the heifers on below-average rations, at 60 weeks.

—Farm Journal

Big Litters and Heavy Weaning Weights

Condensed from the American Hampshire Herdsman

John F. Lasley
University of Missouri

THE production of large, healthy litters of pigs at weaning time is necessary for profitable pork production. This is true because it costs very little or no more to maintain a sow in the breeding herd which weans 8 to 10 large, healthy pigs than it does to maintain one that weans a fraction of this number. Large, healthy pigs also seem to be less affected by adverse conditions such as disease, parasites, castration and vaccination. Almost invariably the heavier and thriftier the pigs at weaning the sooner they will reach a market weight of 200 to 225 pounds. This is important because rapid gains are almost always economical gains.

The size and weight of the litters at weaning are so important that the various swine breed associations have used this as a basis of their production registry program. Litter size and weight at weaning are important because they reflect the prolificacy, milk production and mothering ability of the sow, inherent growth rate of the pig and the skill of the operator in managing and feeding the breeding herd. All of these factors are important. Attention to one and failure to recognize the others does not bring about maximum results.

The growth of the pigs and the number which survive to weaning, then are a reflection of both genetic and environmental factors which show their influence even before breeding and until the pigs are weaned.

The number of eggs produced by the sow is an important factor in governing litter size. For example, a sow which sheds only 4 eggs during a heat period could not be expected to farrow more than 4 live pigs. This is true because each egg is capable of producing only one pig, unless identical twins are produced which is an extremely rare occurrence.

Individual sows of the same breeding and even from the same litters vary widely in the number of eggs they produce. Even the same sow may vary considerably in this respect from one litter to the next. Nevertheless, age is an important factor in governing the number of eggs produced.

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Experiments at the Missouri Agricultural Experiment Station have shown that mature sows produced an average of 15.3 eggs as compared to gilts which produced an average of only 11.5 eggs as shown by slaughter data. It was also found that in the gilts which ranged between 5½ to 9 months in age an additional .35 egg was ovulated for each 10 days increase in age. In other words, the older the gilt at breeding the larger the number of eggs she produced.

Inheritance also probably influences the number of eggs produced by sows. However, data reported by U.S.D.A. workers indicated that only approximately one-sixth of the variation in litter size and weight at weaning could be attributed to genetic influences. The remaining portion of the variation, then, must be attributed to environmental factors. It is probable that the genetic variation in the number of eggs shed by the sow is also low. Missouri data has indicated that this is true. The fact that genetic influence seems to be small doesn't mean that it is not important. On the contrary, it emphasizes the importance of rigid selection for these characters over a period of years. It also emphasizes the importance of selecting prolific foundation stock in establishing a breeding herd.

The practice of "flushing", or feeding the sow heavily before breeding in order to have her in a gaining condition at breeding time, is thought to increase the number of eggs produced. However, there is little experimental evidence to support this practice. It does seem reasonable to assume that thin sows would produce more eggs if they were gaining rapidly than if they were not gaining or were losing weight. There are times, however, when "flushing" might be impractical. It would probably be unwise to "flush" a sow and wean pigs at the same time, because of the danger of damaging the udder and teats of the sow through increased milk production. It is also doubtful if anything would be gained by "flushing" sows which are already too fat. Certainly more experimental work of this nature is needed before definite recommendations can be made regarding this practice.

The number of eggs which are fertilized at the time of mating also influences litter size. The boar must produce the male sex cells (spermatozoa) which unite with the eggs in the process of fertilization and initiates the growth of each new pig. In general, it is thought that fertile boars have very little influence on litter size since they produce millions of viable spermatozoa at each mating

for every egg produced by the sow. There is some evidence, however, that when sows are mated to boars of lowered fertility they produce smaller litters than normal. This may be due to the failure of fertilization of many of the eggs or due to increased embryonic death loss. In addition, to supplying the male sex cells which fertilize the eggs released by the sows, the boar also contributes one-half to the genetic makeup of the pigs. This genetic influence of the boar is important but is usually over shadowed by the influence of the sow at least to weaning time. The genetic influence of the boar on his offspring becomes increasingly important as the pigs become older and are no longer dependent on the sow for nourishment. This influence of the boar fully expresses itself after weaning and when his sons and daughters are kept for the breeding herd.

Two or more matings at intervals during the heat period may increase the number of eggs which are fertilized. Experiments at Missouri have shown that only 65.7 per cent of 79 sows mated once during the heat period became pregnant, whereas in another group of 82 sows which were mated twice at intervals of 12 to 24 hours 85.1 per cent settled. This was a difference of almost 20 per cent.

Two experiments at the Missouri Station and one at Illinois involving a total of 215 sows, 106 of which were mated once and 109 mated twice during the heat period showed that from 0.7 to 1.9 more pigs were produced per litter when the sows were mated twice. Whether or not each sow can be mated twice during the heat period will depend, of course, on the use that is being made of the boar. Even if litter size were not affected by double matings, the fact that a larger percentage of the sows became pregnant would be important enough to warrant the use of this practice whenever possible. Double matings in which a larger percentage of the sows would settle at the first heat period would help to concentrate or limit the farrowing season. This would tend to make the pig crop more uniform in size and age which is desirable in many instances.

Embryonic death loss, or the number of eggs produced by the sow which fail to produce pigs at farrowing time, greatly influences litter size. Considerable work at the Missouri Station has demonstrated that this loss may be 35 to 40 per cent. It was also found that the majority of these losses occurred before the 25th day of pregnancy. Undoubtedly there are numerous causes for these large losses. The breeder may be able

to prevent some by proper feeding and management, but there must be others that he cannot control. The Missouri work indicated that about 5 per cent of the losses were due to a failure of fertilization. Many other eggs were fertilized but failed to develop properly. Proper nutrition and management of the sow may also be important in preventing some of these losses although there is a lack of good experimental evidence to prove this point. On the basis of present information bred sows should be fed a complete and well balanced ration containing the necessary vitamins, minerals and proteins of proper quality and quantity. The amount of feed should also be controlled so that the sows or gilts do not become too fat during the gestation period. Extremes in condition should be avoided. Mature sows should gain approximately 75 to 100 pounds and gilts 100 to 125 pounds during the period of pregnancy. In the past, emphasis has been placed on the increased feed allowances during the last one-third of pregnancy because the unborn pigs make most of their growth during that time. However, there is a possibility that the first 25 to 30 days of pregnancy may be just as important as indicated by the large embryonic death loss during that time.

Death losses after farrowing are important in governing litter size and total litter weight at weaning. In fact, it is usually recognized that an average of only 6 of every 10 pigs farrowed survive to market age. There are numerous causes for these heavy losses and many of them can be controlled by the swine producer.

There is considerable evidence that the nutrition of the sow during pregnancy may influence the size and vigor of the pigs at birth. It is now recognized that a ration may produce satisfactory gains in brood sows during pregnancy but may be inadequate as indicated by the birth of dead pigs or a lack of vigor and vitality in those which are farrowed alive. A lack of good quality protein, minerals and vitamins in the ration of the pregnant brood sow may be responsible for these conditions. Unlike other animals such as cattle and sheep, swine cannot manufacture good quality protein and certain B-complex vitamins through the action of microorganisms in their digestive tract. Because of this fact, swine must receive these nutrients in their feed in order to grow and reproduce satisfactorily.

Good management of brood sows and their litters is also an important factor in preventing losses in baby pigs and insuring large litter weights at weaning time. One of the important steps

in management which help cut pig losses is to know the breeding date of the sow. She should be placed in the farrowing pen 4 to 5 days before she is due to farrow. This is especially important in the early spring when the weather may be extremely cold. Many new born pigs are lost each year because they were farrowed in the lot or pasture during very cold weather.

Sanitation and disease control not only prevent baby pig losses but help to produce healthy, vigorous pigs at weaning time. The sows should be thoroughly washed with soap and water to remove dirt and filth which may harbor disease germs and worm eggs before she is placed in the farrowing pen. The farrowing pen should be thoroughly cleaned and disinfected to destroy worm eggs and to control disease. Antiseptics or disinfectants help destroy certain disease organisms but usually do not destroy round worm eggs, although all are destroyed by high temperatures. Boiling water containing 1 can of lye for each 25 gallons of water should be used for cleaning the farrowing pen. When the pen is dry and sprayed with a disinfectant, the clean sow should be brought in. Extreme care to prevent worm infestations and to control disease will pay off in larger, healthier and faster growing pigs at weaning. It is folly to disregard the prevention of worm infestations and disease control in favor of treatment with certain drugs. Removal of worms after the pigs are already infested is like locking the door after the horse is stolen as far as that individual pig is concerned. Most of the damage to the pig is done to the lungs, liver and other tissues as the small roundworms pass through these organs during that phase of their life cycle. Removal of the worms after the damage is already done usually benefits the pigs very little except, of course, in severe infestations in which digestive disturbances may result. Worming pigs may be important, however, in preventing the scattering of eggs around the pens and lots. If most of the damage to the pig is already done before the worms reach their final resting place in the intestines, the importance of prevention rather than treatment should be greatly emphasized. The same is true in the prevention of numerous diseases.

The installation of pig brooders in the farrowing pens prevents some losses in young pigs after farrowing. Purdue experiments involving 105 litters of pigs farrowed during February and March over a three year period showed that pig brooders saved an average of 1.5 pigs per litter. The kind of pig brooder probably is not so

important as long as the temperature is maintained at the desired level. Many cheap, home made brooders may be as efficient and as satisfactory as the more expensive types.

Guard rails in farrowing pens prevent pig losses and they are easily and cheaply installed. Guard rails should be 8 to 10 inches above the floor and 6 to 8 inches from the wall.

Kentucky experiments have indicated that sloping floors in farrowing pens saved more pigs than level floors. Sloping floors were effective because the sows would lie with their heads or backs up the slope, and the pigs would usually gravitate to the lower end of the slope under a guard rail. In these experiments involving 385 litters on 49 farms, an average of 1 pig out of every 4 was overlaid on level floors. On the other hand, an average of only 1 pig in 30 was overlaid on sloping floors. A slope of 1 inch to the foot was satisfactory.

Proper feeding of the sow immediately before and after farrowing is important in preventing losses in baby pigs. Before farrowing the sow's grain ration should be reduced by approximately one-half and one-half of this should be replaced by a bulky feed such as ground oats or wheat bran. This will prevent constipation of the sow and will help to speed her recovery from the ordeal of farrowing. The sow should be watered but not fed for 24 hours following farrowing. A small amount of the bulky ration should be fed the second day. The amount of feed should be gradually increased each day until the sow is on full feed in about 2 or 3 weeks.

Attention to the sow and pigs at farrowing time prevents death losses especially when the sow farrows in very cold weather. A little extra labor on the part of the operator at this time will almost always return good wages in the number of pigs saved. Newborn pigs should be dried at birth, encouraged to nurse and should be placed under the brooder to keep them warm. The navel cord should be clipped and the end dipped in an iodine solution to prevent the invasion of infectious organisms. The needle teeth should be clipped with a pair of pliers or some other suitable instrument to prevent injury to other pigs in the litter and to the sow's udder.

Anemia may cause severe losses in baby pigs and permanent damage to those which survive when pigs are maintained on concrete or wooden floors during the first 10 days or two weeks of their life. Under these conditions the pigs develop anemia because the store of iron and copper in their bodies

is small at birth and the amount in the sow's milk is also very low. These minerals are necessary for the production of red blood cells in the body of the new born pigs. Anemic pigs lack vigor, have rough hair, wrinkled skin and either die or become runty. Those which survive recover slowly and make very slow and inefficient gains during the rest of their lives. Iron and copper must be supplied directly to the pigs shortly after birth to prevent anemia. Feeding of these minerals to the sows will not prevent anemia because the level in the milk is not increased. Clean, worm free soil or sod placed in one corner of the farrowing pen will usually supply enough iron and copper to prevent this disease. A solution of 500 grams of iron sulfate, 7 grams of copper sulfate, 7 grams of manganese sulfate dissolved in 1 gallon of water used as a daily swab or spray on the teats and udders of the sow is also effective in preventing anemia.

The size and weight of the pigs at weaning is dependent on a number of factors. Among these the milk production of the sow is very important. During the first three weeks of their life, the pigs are dependent almost entirely on the mother for the nutrients they receive. Sows which produce plenty of good quality milk usually wean pigs which are vigorous and healthy. Undoubtedly the milk producing ability of the sow is an inherent trait and gilts for the breeding herd should be selected from sows of proved milk producing ability.

The peak in milk production in the sow is usually reached when the pigs are approximately 3 weeks of age. It is also significant that the pigs begin to consume small amounts of grains and other concentrates at this time. Since the sow's milk production normally begins to slacken and the food demands of the pigs increase rapidly after this time, supplemental feeding is necessary for rapid gains in the pigs. Additional feed may be supplied in a creep or both sows and pigs may be allowed access to a self feeder. A ration for sucklings pigs should be well balanced, palatable and as concentrated as possible.

Suckling pigs will eat large amounts of rations which are palatable and well balanced. The more of these rations the pigs eat the faster they will grow and the heavier they will be at weaning time. Concentrated rations will supply more nutrients per unit volume than those which are very bulky. Because of this fact it takes less of a concentrated ration for each pound of gain. Gains made by the pigs during the suckling period are most economical of any made during the pigs life,

and the hog producer should take advantage of this by feeding a good ration in order to produce as large and as rapid gains as possible.

Most swine producers have a ration which they prefer above all others for suckling pigs. Skim milk is excellent and is hard to equal if fed with corn or other cereal grains, but it is seldom available because of the value of milk as a human food. As a result, rations for sows and suckling pigs must be formulated using feeds which are available on the farm and on the market. The following ration has given excellent results in the swine herd at the Missouri Station when used either on pasture or dry lot:

Ground yellow corn	1558
Ground wheat or shorts	78
Soybean oil meal	236
Tankage	78
Minerals	50
Cod liver oil	10

As was pointed out previously disease and parasite control are necessary for the production of large, healthy litters at weaning. Scours is one of the many diseases which affects nursing pigs. Recent work with antibiotics indicates that at least some of these drugs are effective in controlling certain types of scours. There is also considerable evidence that some of the antibiotics stimulate growth when fed to healthy and vigorous pigs. Much remains to be learned about these new drugs before their place in the ration of suckling pigs is known. Nevertheless, evidence available at the present time indicates that some of the antibiotics have definite possibilities when added to the rations of sows and pigs during the suckling period.

The inherent growth rate of the pig determines to a certain extent the size and weight at weaning. This point should be considered by the swine producer in selecting animals for his breeding herd.

The preceding discussion has pointed out some of the many factors which influence the production of large, healthy litters at weaning. This discussion has also pointed out that these show their influence over a period of time beginning before conception and until the pigs are weaned. It should be further pointed out that a good breeding program is the foundation of a successful swine producing enterprise. The inheritance of the pigs limits their potential ability to grow and reproduce. Proper feeding, management, parasite and disease control helps the individuals to take advantage of their inheritance. Attention to these factors, however, cannot enable the animal to surpass its inherent ability to grow and reproduce. It is also true that

a good breeding program is futile without proper attention to the environmental factors mentioned above. In the final analysis, efficient swine production is dependent on the skill of the operator who must combine certain genetic and environmental factors in such a manner as to obtain maximum results.

Obtaining Good Breeding Efficiency

Condensed from the Southern Planter

J. W. Pou and E. J. Weatherby
University of Maryland

Cows that breed regularly and calve normally are the most profitable. Good reproductive health can be maintained in the herd by observing the rules that follow:

1. Keep a record of freshening dates, heat dates, and service dates on all cows. This will help detect irregularities, and will aid the veterinarian in diagnosing trouble.

2. Turn open cows out *twice daily,* and observe carefully for heat periods.

3. Cows should not be bred until they have been fresh about 60 days. Service soon after freshening results in a low conception rate and poor reproductive health of the cow at the next calving.

4. If a cow had trouble in calving, retained the placenta, or showed an abnormal discharge after calving, have her examined and treated by a veterinarian until her genital organs are normal before breeding.

5. Any cow that has been fresh 80 days without indicating heat should be examined by a veterinarian. Heat may need to be induced, or the cow might be with calf due to an unscheduled date with a bull.

6. Provide veterinary treatment promptly for cows that have cystic ovaries, as indicated by too frequent heat periods. *Early treatment for cystic ovaries is usually successful,* but if treatment is delayed, permanent sterility often is the result.

7. Do not breed a cow with an unnatural discharge; that is, one with discolored or flaky mucous.

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Richmond, Virginia, February, 1951

The passing of some blood from the vagina 1 to 3 days following heat is a normal process in most cows.

8. Provide service at the most opportune time for conception. Cows *first observed* in heat *in the afternoon,* and which definitely were not in heat before noon, should be bred the following morning.

9. If a cow does not conceive from the first three services, do not breed her again until she has been examined by a veterinarian. A sexual rest period without service often aids conception.

10. Dry cows off 60 days before calving, and have cows in good physical condition at calving time.

11. Provide a clean comfortable maternity stall for calving.

12. A good ration, fed liberally, is essential for maintaining good protection and reproduction. "Shot-gun" mineral and vitamin mixtures are not needed.

13. Calves and heifers should be well fed so they will make a good, steady growth. Poor quality rations and underfeeding can cause permanent damage to the reproductive organs of young, growing heifers. A clean, healthy environment is also essential.

14. As a guide in the above recommendations it should be remembered that a conception rate of 60 per cent from the first service is a good breeding efficiency. Normally it is expected that from 5 to 10 per cent of the females are sterile. It is therefore reasonable to expect that one cow will be sold as sterile each year for every 10 to 20 females in the herd.

Chicken-Hearted

Father Irwin D. Nugent, Maryknoll Missionary from Dorchester, Mass., found that poultry farmers in Kweilin, China, are convinced that Americans are barbarians when it comes to killing chickens.

"In China," a farmer told Father Nugent, "we get the chicken intoxicated on a special rice wine before chopping off his head. This relaxes the victim, making the meat more tender and tasty when cooked. In your country, the chicken is first chased around the yard by a man with a cleaver. How can a chicken relax with a barbarian running after him to cut off his head?"

—Everybody's Poultry Magazine

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Blaise Pascal

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